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PAST AND PRESENT TRADE ROUTES TO THE CANADIAN NORTHWEST

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One of the interesting phases of the history of Western Canada, and one which has received but little emphasis, is that of transportation, particularly the changes in both routes and methods which have taken place largely because of the advance of the railroad. In the present period of railroads and lake steamers it is not commonly appreciated how great were the difficulties formerly encountered in carrying on an active trade between points as far distant from each other as Montreal and the upper Peace River or Hudson Bay and the lower Mackenzie, each a distance of over 2,000 miles. The character of the country and the nature of the waterways accentuated the difficulties of transportation and limited the supplies brought into the region to the bare necessities required for the fur trade. The development in the methods of transportation since that time and the consequent changes in trade routes form the subject-matter of the present article.

Historical Summary

From a geographical point of view the history of the Canadian Northwest may be divided into a number of periods which, though they overlap to a greater or less extent, are sufficiently distinct to be helpful in a survey of the larger historical features.

PERIOD OF ISOLATION

The first period may be described as one of isolation, with the country in possession of the Indian hunter and unexplored and undisturbed by the white man. Away to the east lay the French settlements at Quebec and Montreal and the English and Dutch on the Atlantic seaboard; but little did any of these conceive the extent of the continent which lay between them and the western sea.

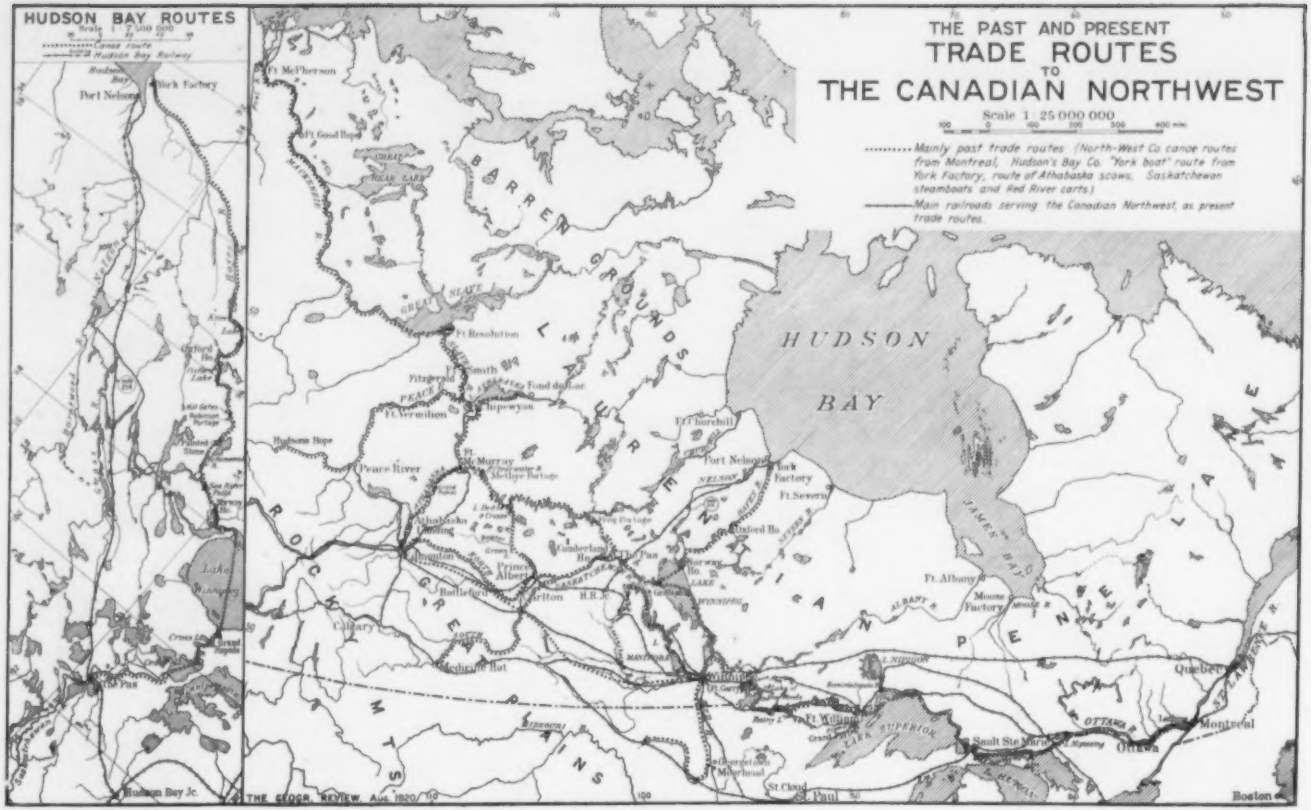
HUDSON BAY ROUTES
THE PAST AND PRESENT
TRADE ROUTES
TO
THE CANADIAN NORTHWEST
Scale 1:25 000 000
Mainly past trade routes (North-West Co canoe routes from Montreal, Hudson's Bay Co. "York boat" route from York Factory, route of Athabaska scows, Saskatchewan steamboats and Red River carts.)
Main railroads serving the Canadian Northwest, as present trade routes.
HUDSON BAY
BARREN GROUNDS
LAURENTIAN
CANADIAN SHIELD
ROCKY MOUNTAINS
Port Nelson
York Factory
Fort Churchill
Fort Severn
Fort Albany
Moose Factory
Fort Resolution
Fort Vermilion
Fort McMurray
Peace River
Edmonton
Calgary
Medicine Hat
Prince Albert
Winnipeg
Lake Superior
Sault Ste Marie
Ottawa
Montreal
Quebec
Boston
St Paul
Hudson Bay Jc.
THE GEOGR. REVIEW, Aug. 1920/19

FIG. 1

The Trader Reaches the Border

The second period is that in which the trader reaches the border of the great interior country. To the white man the resources of the country were twofold. Its broad extent, its soil and timber, suggested possibilities for the founding of new colonies. The immediate value, however, which first lured him was its fur trade. Contact was made at two points. The French from Montreal and Quebec advanced westward following the natural waterways and finally reached Lake Winnipeg. They ascended the Red River and in 1742 reached the Missouri. They also discovered Lake Manitoba and explored the Saskatchewan River to the forks. Thus the border was reached from the south.

Contact was also made in the northeast on the shores of Hudson Bay. In the year 1670 a charter was granted by King Charles II to "The Governor and Company of Adventurers of England Trading into Hudson's Bay" giving them the monopoly of the trade, fisheries, minerals, etc., of all the lands bordering on Hudson Bay, in return for which the company was to govern and defend the territory. Trading posts were established first on the coasts of James Bay and then on the western coast of Hudson Bay. These posts were all located at the mouths of important rivers which offered communication with the interior. The Indians were induced to come to the forts to trade, and, as long as their fur-loaded brigades came annually to the posts, no attempts were made by the English traders to penetrate inland. The long trips which the natives made to the coast forts showed how great was their desire for the company's goods. For example, as late as 1782 the Chipewyan Indians of Lake Athabaska sent or carried their furs overland to Fort Churchill at the mouth of the Churchill River, a journey which occupied five or six months and in which they were often reduced to the greatest extremities of hunger and fatigue owing to the scarcity of game in the region which they crossed.

The Trader Penetrates Inland

A new period began when it became necessary for the trader to penetrate inland. After the transfer of Canada to the British in 1763 a great influx of English-speaking merchants, many of them of Scottish descent, took place to Montreal. These soon found the fur trade of the interior to be very profitable, and it was not long before their *voyageurs* had rediscovered the old French canoe routes and penetrated even farther into the Northwest. Their trading operations with the Indians were so successful that they resulted in the obtaining of much of the fur that ordinarily went to the Hudson's Bay Company. This stopping of the flow of furs to their forts aroused the English company to the fact that, if they were to retain the trade, it was necessary to establish inland posts; accordingly, in 1774, Samuel Hearne, famous for his overland voyage from Fort Churchill to the Coppermine River in 1769–1770, established Cumberland House on Sturgeon Lake north of the Saskatchewan River, and the contest between the Scotch merchants of Mon-

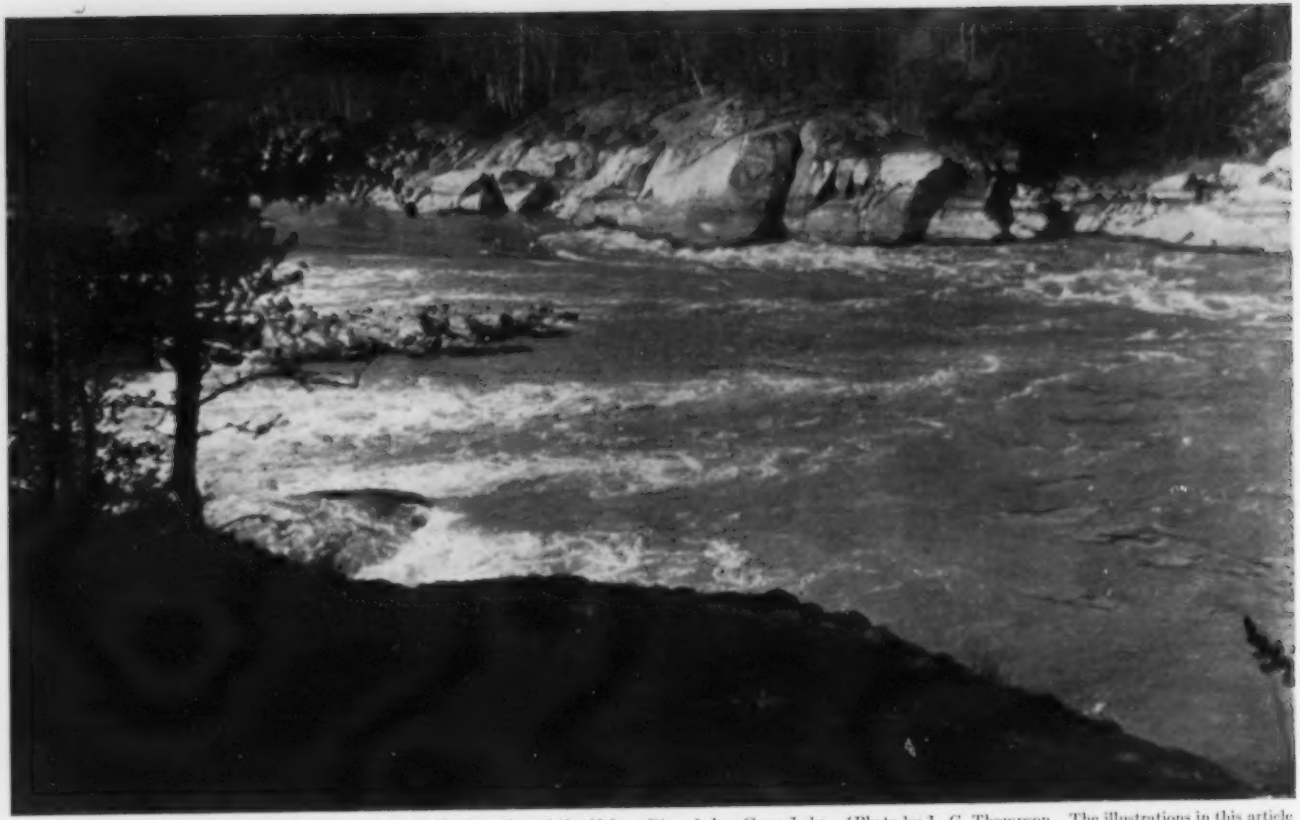

FIG. 2—Running a rapid on "The Elbow," one of the branches of the Nelson River below Cross Lake. (Photo by L. G. Thompson. The illustrations in this article are chiefly from official photographs of the Geological Survey of Canada.)

treal and the English merchants of the Hudson's Bay Company was actively begun. The union of the Montreal merchants in the year 1784 into one North-West Company intensified the competition, for there were now two strong organizations each striving for control.

This period of rivalry was also an era of important exploration, since it was realized that the posts established nearest the hunting grounds received the trade. Some of the more important features of this may briefly be summarized. Under the North-West Company the old Kaministiquia route from Lake Superior to the Winnipeg River was rediscovered, and the exploration of the Red, Assiniboine, and Saskatchewan Rivers was accomplished. A new route from Lake Nipigon to the Winnipeg River was found, and also the route from the Saskatchewan to the Churchill River by way of Frog Portage and from there the route by way of Methye Portage to the Athabaska River. Lake Athabaska and the Peace River were discovered, and in 1789 Alexander Mackenzie, a North-West partner, followed the river which bears his name to the Arctic Ocean. In 1793, on a second journey, he reached the Pacific Ocean from the headwaters of the Peace, the first white man to cross the continent. Of other exploits of the North-West explorers may be mentioned the discovery of several important passes through the Rocky Mountains and the descent of the Fraser and Columbia Rivers to the ocean.

To the Hudson's Bay Company are due the exploration of the Nelson and Hayes Rivers and of the Churchill as far as Frog Portage and the discovery of Great Bear and Great Slave Lakes and the Coppermine River by Samuel Hearne. The Saskatchewan was also followed to the upper waters of both of its branches.

The rivalry led to many conflicts in the wilderness between the men of the two companies. Those employed by the North-West Company were largely French Canadians, and the company especially sought those who were eager for physical conflicts with their rivals. The men of the Hudson's Bay Company, on the other hand, were mainly Orkney Islanders, less quarrelsome but marked by great loyalty to their company.

The Settler Reaches the Border

The next stage in the history of the region may be described as that in which the settler reaches the border. In 1811 Lord Selkirk of the Hudson's Bay Company sent out a contingent of settlers from Scotland, and in 1812 they arrived at the Red River. In 1815 another band arrived. A new era had begun in which it was realized that the country had a source of wealth other than furs. The arrival of settlers was, however, not at all welcome to the traders of the North-West Company, and the climax of the struggle between the two rival organizations was reached on June 19, 1816, when Governor Semple of the Red River colony and twenty of his men were killed at Seven Oaks by North-Westers. The final result was a union of the two companies in 1821 under the name of the Hudson's Bay Company.

After the union the operations of the company attained their maximum extent, reaching down along the North-West Company's routes into Oregon and later into northern British Columbia and the Yukon.

The Settler Develops the Plains

The final period, which may be considered to extend to the present, is that marked by the westward advance of the settlers as they spread out over the Great Plains. Settlements grew up first around the old trading posts of the plains, then along the trails and rivers, and finally along the railroad as rapidly as it advanced. Henceforth trade with the settlers was to take precedence over the fur trade on the prairies. North of the settled belt, however, in the regions where agriculture is impossible, the fur trade maintains its old importance. On the Saskatchewan trade in connection with a new mineral interest has recently developed, and Cumberland House, instead of being a gateway to the fur wealth of the Athabaska region, has become the point of entrance to a new copper and gold belt.

The latter part of this period of settlement is chiefly marked by railroad development. Since 1879 the railroad has extended out over the Great Plains in all directions, and wherever it has gone it has caused the abandonment of the pioneer methods of transportation.

The Route from Montreal

As already stated, the early important posts of the Hudson's Bay Company were on the coast of Hudson Bay, while the headquarters of the North-West Company were at Montreal. The former, therefore, had a much shorter distance to transport their trading supplies than the merchants of Montreal. They also brought in a superior quality of goods, which the Indians soon recognized, and in addition they established a reputation for fair dealing, both of which tended to give them a decided advantage over their North-West rivals. The latter, however, had certain considerations on their side in the contest. From Lake Winnipeg westward the routes followed by the rival traders were practically identical, and the North-Westers in their swift canoes usually had little difficulty in outracing the slower boats of the traders from the bay. The French Canadians, besides being expert canoemen, were also quick to learn the language of the Indians and to make friends with them, although they never succeeded in inspiring the respect which the English company's traders commanded.

Two water routes could be followed from Montreal to Lake Superior. One led from the St. Lawrence River by way of Lakes Ontario and Erie to Lake Huron. The one more commonly used by the fur traders, however, was by way of the Ottawa River (see map, Fig. 1). The half-way post between Montreal and the Northwest was first at Grand Portage on Lake Superior, near the mouth of the Pigeon River, but when this became American territory a new route was sought by the North-West Company. One

was found by way of Lake Nipigon, but later a better route was discovered and a new headquarters post, named Fort William, was accordingly built at the mouth of the Kaministiquia.

Method of Transportation

The supplies that were to be distributed throughout the Northwest as far as the Athabaska country were carried from Montreal in canoe brigades. The canoe commonly used was the large birch-bark "rabascaw" with high, rounded ends and about 33 feet long and 4½ feet wide, or, as the canoemen would describe it, the "five-and-a-half fathom variety." Its cargo consisted of 1,000 pounds of provisions and 60 pieces of merchandise for trade, each weighing from 90 to 100 pounds. Including the weight of the canoemen, of whom there were eight to a canoe, and their personal bags weighing 40 pounds each, the load was therefore about four tons. As the operations of the traders widened, the brigades steadily increased in size. The early Montreal traders sent out brigades of three or four large canoes, often accompanied by smaller ones. Around 1800 the squadron that left Montreal in the spring usually consisted of about thirty, divided into three brigades. Later, when the North-West Company was at the height of its power, brigades numbering from ninety to one hundred large canoes would gather at Lachine immediately above Montreal for their journey to Fort

Fig. 3—A bark canoe on the Missinaibi River, 1901. It was this type of canoe that was used by the French-Canadian *voyageurs* of the North-West Company. (Photo by D. B. Dowling.)

William. With these brigades would be thirty or forty guides and usually a partner of the company in command, traveling in state in a smaller, swift canoe.

Montreal to Fort William

From Lachine the canoes proceeded up the Ottawa River, past the Long Sault Rapid—the Chaudière Falls at the site of the present city of Ottawa—and on over thirty-six other portages. From the Mattawa, a tributary of

Fig. 4

Fig. 5

Fig. 4—A York boat.

Fig. 5—York boats on the Echimamish, a stream connecting the Hayes and Nelson Rivers drainage. (Photos by E. L. Bruce.)

the Ottawa, the divide was crossed to Lake Nipissing, and then the route lay downstream to Lake Huron. There the brigades would sweep along the north shore, in fair weather traveling from three o'clock in the morning until late in the evening; then up the St. Mary's River, past the Sault Rapid and into Lake Superior; skirting the north shore of the lake, they hurried on to Fort William. There a couple of weeks were usually spent in preparing for the return journey, and then the canoes, loaded with furs collected from the West, started on their return journey to Montreal.

Fort William to Lake Athabaska

From Fort William new brigades starting in August carried the trading supplies to the far distant points of the West. Smaller canoes about twenty-four feet in length, easier to portage than the big canoes used on Lake Superior, were used in these Western brigades. The route led up the Kaministiquia River to the height of land and thence downstream to Rainy Lake. On every long portage was a cabin where food and drink could be purchased by the *voyageurs*. On Rainy Lake the fur brigades from Athabaska were often met by the *voyageurs* from Montreal, since it was usually too long a journey for the former to go as far as Fort William and to return in the same season. On the lakes the brigades frequently had the opportunity to take advantage of a fair wind. Canoes would then be lashed together, sails

Fig. 6—York boats under sail, Cross Lake. The York boat has been the usual means of conveyance between Hudson Bay (York Factory) and Lake Winnipeg (Norway House). (Photo by M. McIvor.)

hoisted, and the canoemen could rest from their paddles. Often over one hundred canoes would thus be seen together.

From the Lake of the Woods the brigades followed down the turbulent waters of the Winnipeg River, a stream with so many falls and rapids that it was called by the *voyageurs* the White, or Foaming, River. Arrived at the southern end of Lake Winnipeg, the brigades separated. Some would cross to the mouth of the Red River and ascend it to the mouth of the Assiniboine. Here a further division would take place, some ascending the Red River with supplies for the natives as far as the Missouri River; others would ascend the Assiniboine for trade on Lake Manitoba and the Swan River country. The northern brigades for the Saskatchewan and Athabaska, however, proceeded from the mouth of the Winnipeg River along the eastern shore of Lake Winnipeg, and then across its northern end to Grand Rapids at the mouth of the Saskatchewan River. Above what is now the

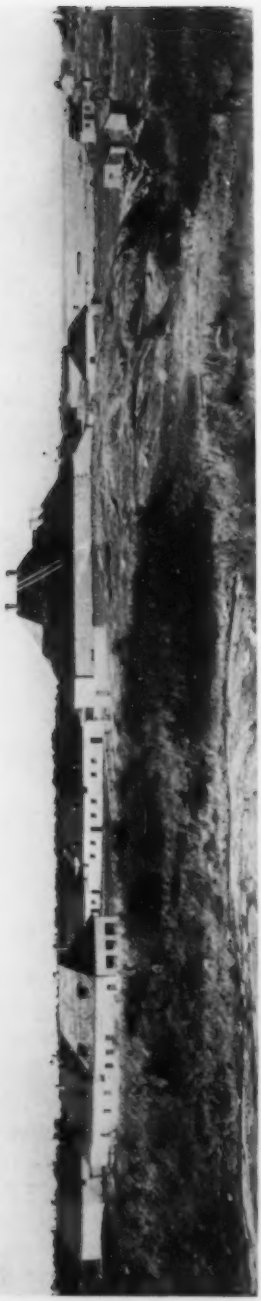

FIG. 7—Norway House, a Hudson's Bay Company's post on the eastern branch of the Nelson River near the outlet of Lake Winnipeg. Norway House was long one of the company's most important posts. (Photo, 1919, by F. J. Alcock.)

town of The Pas on the Saskatchewan, a separation took place. Some of the brigades proceeded up the two branches of the Saskatchewan. Those bound for Athabaska, however, left the Saskatchewan near Cumberland House, crossed Cumberland and Sturgeon Lakes, and ascended the Sturgeonweir River to Frog Portage, where a portage of four hundred yards took them into the waters of the Churchill River. The Churchill was then ascended through Lake Isle à la Crosse to its headwaters in Lake la Loche.

Here, between Lake la Loche and the waters of the Athabaska basin, lay the famous long portage known as Methye Portage, or Portage la Loche. Its length is $12\frac{1}{4}$ miles, and for a period of one hundred years it formed the most serious obstacle in the transportation to and from the Athabaska country. For most of its distance the trail crosses a level sandy surface covered with pine and spruce. About a mile from the northwestern end, however, is an abrupt rise, about 600 feet high, which consists of a series of eight steep hills whose ascent and descent for the *voyageurs* carrying packs or canoes proved equally difficult. From the summit of the portage the view overlooking the valley of the Clearwater River has been described as one of the most beautiful scenes on the continent. Once across the long portage the brigades had a downstream route along the Clearwater and Athabaska Rivers to Fort Chipewyan on Lake Athabaska, the important rendezvous and distributing point for the Athabaska-Mackenzie region.

The Route from Hudson Bay

The main route of the Hudson's Bay Company by which supplies and merchandise were taken from the coast to

FIG. 8

FIG. 9

FIG. 8—Norway House. (Photo by F. J. Alcock.)
FIG. 9—Inside the quadrangle, Norway House. (Photo by E. L. Bruce.)

their inland posts as far as the lower Mackenzie River was for nearly one hundred years the Hayes River. Other rivers, such as the Churchill, the Albany, and the Moose, were important in supplying large areas, but the main highway for the West began at York Factory.

York Factory

The history of York Factory may be said to have begun in 1682, when two French-Canadian adventurers, Radisson and Groseilliers, who earlier had been largely responsible for the formation of the Hudson's Bay Company and had led its first expeditions to the bay, reached the Hayes River and built Fort Bourbon on its northwestern bank. In 1684 Radisson re-entered the service of the Hudson's Bay Company and took possession of Fort Bourbon, renaming it York. In 1694 York was captured by the French under the command of Pierre le Moyne d'Iberville and was retained by them for two years, when it was recaptured by the British. In 1697 d'Iberville, after defeating a British fleet in the bay, again captured York, and again it became Fort Bourbon. In 1713 by the Treaty of Utrecht it was given back to the British and occupied by them until 1782, when it was once more captured and burnt by the French. In the following year a new fort was erected. In 1792 new buildings situated a mile upstream on the present site of York Factory were completed.

York long remained the Hudson's Bay Company's most important post. Once a year the company's ship arrived from England with provisions and articles for trade, and it was a rule to keep at least two years' supplies for all the posts of the interior in the large warehouses to guard against all contingencies. Part of the merchandise received from England came packed in bundles suitable for the trip inland: for example, bales of blankets and cloths, kegs of gunpowder of $66\frac{2}{3}$ pounds weight each; chests of tea of 50 and 100 pounds weight; cases of soap; cases of Indian flintlock guns and rolls of tobacco, etc. Other articles were repacked, however, at York. In this repacking care was taken not to place all of the articles of one kind intended for a particular post in the same bale, so that, should any pack be found missing, the loss for a particular fort would not be total in respect to any one necessity. Similarly, in bringing fur out from the interior to York each bale was made up of pelts of various kinds in order not to run the risk of losing a pack which might consist entirely of the more costly furs. Besides the materials brought out from England, many articles were manufactured at York for the trade inland. Blacksmiths and tinsmiths made such articles as Indian axes, ice chisels, fish spears, nails, tin kettles, cups and bowls in nests, and many other articles. York Factory to a certain extent was a real factory.

Method of Transportation

The trip inland was made, not with canoes like the North-Westers, but in pointed, flat-bottomed vessels about 35 feet long, known as York boats. Each boat was manned by a crew of eight or ten and could carry about

five tons of cargo. In the early days the crews consisted of Orkney men, but later when the brigades increased in number it became necessary to employ Cree Indian crews, and the problem of getting sufficient men to man the boats was often acute. On lakes and smooth streams the boats could take off a fair breeze by hoisting a large square sail; when there was no such favorable wind they were rowed by eight oars and steered by a long sweep at the stern. Going upstream the vessels were commonly tracked with a

FIG. 10

FIG. 11

FIGS. 10-11—Two views of the gorge known as Hill Gates on the Hayes River above Oxford Lake. (Photos by E. L. Bruce.)

long towing line by the crew walking along the bank. The portages around falls and rapids were cut into regular roads, and smooth poles were laid down every few feet, over which the crews hauled their boats. The boats traveled in brigades composed of four or five boats, and, though each crew carried their own cargo across the portage, they usually united to take the boats across. On portages where the boats had to be pulled up over a hill a windlass was commonly stationed at the summit. The rivalry between the crews of the different boats led to a much greater amount of speed and

effort than when a boat was traveling alone. The racing sometimes had a practical significance. In June, 1919, while the writer was making a portage at Sea River Falls on his way down the Nelson River, he had the opportunity of seeing an example of this in a race between five empty York boats which were ascending the river. The boats rowed up and took their positions behind one another at a rock in the rapids, and the crews of all five worked in getting the first up over the fall. When this was done its crew immediately got in and rowed on. The second proceeded likewise. When the turn for the third came, however, there were not enough men to get it over, and the last three boats had therefore to row down to a side channel where the ascent was more gradual and required longer work.

The rivalry was not only between the separate boat crews but extended down to the individual members of the crews. A common load across a portage consisted of two pieces, but great pride was taken in carrying three or even more at a single trip and in crossing either way on the run. The attitude adopted was that the quicker the disagreeable work was finished the better. Spells of hard work alternating with periods of rest was the type of work most acceptable to the Indian, and the traders soon found they could accomplish more by adopting this method. In tracking, the boat crew was commonly divided into two parts, one of which rested on board, while the other worked, with a change every half hour. They frequently adopted the same plan in rowing. When there was a head wind on a lake they calmly waited for more favorable weather, and then, when it arrived, would travel early and late at high pressure to make up for lost time.

York Factory to Norway House

The first part of the journey from York up the Hayes meant tracking for the most part, and farther on, where the stream became swifter and rapids numerous, besides tracking it became necessary in places to row, pole, push, and warp. On Knee and Oxford Lakes there was often an opportunity to sail, which meant a rest and sleep for the hard-worked crews. Above Oxford Lake there was more upstream work. At one place, known as Hill Gates, a gorge three-quarters of a mile in length is so narrow that the York boats cannot at certain points use their oars for rowing. Farther on at Robinson Portage boats and cargoes have to be taken overland for a distance of about a mile. Fifteen miles above Robinson Portage the route leads up a narrow stream known as the Echimamish, a Cree name, meaning a river which flows both ways. It is a narrow shallow creek winding through a grassy marsh, and sufficient water for boat travel is kept in it by dams. These dams were originally the work of beaver, but after these were exterminated, the dams were kept in repair by the company. At what is known as the Painted Stone a short portage leads across the divide to the part of the Echimamish which flows westward to the Nelson River. Arrived on the Nelson it was upstream once more to Norway House on the eastern branch of the Nelson near the outlet of Lake Winnipeg.

Norway House to Methye Portage

Norway House long occupied a position among the posts of the company second in importance only to York Factory. The goods received from England in the summer were repacked at York during the succeeding winter. In the following summer these goods were freighted to Norway House and stored there for the winter to be carried in the succeeding freighting season to Methye Portage. This journey to the divide between the Hudson Bay and Mackenzie River slopes was also made by York boat brigades manned by Indian crews. The route led across the northern end of Lake Winnipeg to the mouth of the Saskatchewan River. Here were encountered the

Fig. 12—A Red River cart brigade. The Red River carts were used in the pre-railroad days for transportation across the Great Plains from Fort Garry (Winnipeg) to Battleford and Edmonton. (Photo by George M. Dawson.)

Grand Rapids of the Saskatchewan River, approximately three miles in length. A portage a little over a mile long leads past the most troublesome part of the rapid. The boats were commonly tracked with half a load up the rapid to the foot of the portage, unloaded, run down again, and then tracked up once more with the remainder of the load. The cargoes were then portaged, and the boats, each with about 1,300 pounds of cargo left in, were pulled up the southern side of the rapid to the upper end of the portage. When the brigades were small and poorly manned they frequently took boats as well as cargoes over the portage. A tramway 3½ miles in length was eventually built in 1871 to portage the cargoes past the entire length of the rapid. Above the expansions west of Grand Rapids known as Cross and

Cedar Lakes, the current of the Saskatchewan is strong and the boats were tracked most of the way to Cumberland House. From here the route followed was the same as that employed by the North-West canoe brigades, up the Sturgeonweir, across Frog Portage to the Churchill River, and on to the long Methye Portage. For a time the York boats were dragged overland across the long portage, but it was eventually arranged that two brigades of boats should operate, one from Fort Chipewyan on Lake Athabaska to Methye Portage and one between Methye Portage and Norway House. This eliminated the arduous work of dragging the heavy boats such a distance but, on the other hand, necessitated careful planning on the part of the officials at Norway House in order that the two brigades should meet at the portage without a long wait by either party. Sometimes it was im-

FIG. 13—The tug *Victor*, plying between Warrens Landing, at the northern end of Lake Winnipeg, and Norway House. Steamers run weekly from June to early October from Selkirk on the Red River to Warrens Landing.

possible to restrain the Indian crews from starting back home with empty boats without waiting for the arrival of the fur cargoes from the Athabaska region.

York Boat Freighting

York boat transportation reached its maximum when the supplies for the Red River colony as well as for the Western trading posts were brought in by the route from Hudson Bay. In the year 1858, 167 boats passed Norway House on their way to York Factory to return with supplies for the Red River settlements. These belonged to private merchants and traders as well as to the Hudson's Bay Company.

Freight rates under the York boat transport system were necessarily high. The load of a boat consisted of at least seventy bundles, or "pieces," each piece of 90 pounds weight. From York Factory to Norway House, the freight charge per piece was $3.50; from York Factory to the Red River settlement, $4.50; from York Factory to Edmonton, $7.50; to Athabaska, $10.00; and to the Mackenzie River, $12.50.

FIG. 14

FIG. 15

FIG. 14—The Hudson's Bay Company's steamer *Grahame*, Lake Athabaska, June, 1914. The *Grahame* is a typical stern-wheeler that has seen service since 1882. (Photo by Francis Harper.)

FIG. 15—Modern transportation on the Peace River: the steamer *D. A. Thomas* at Peace River. (Photo by F. H. McLearn.)

FIG. 16

FIG. 17

FIG. 16—At the head of the Grand Rapids of the Athabaska River. (Photo by F. J. Alcock.)

FIG. 17—The tramway across Grand Rapids Island, connecting the interrupted reaches of the Athabaska River. (Photo by Francis Harper.)

FIG. 18

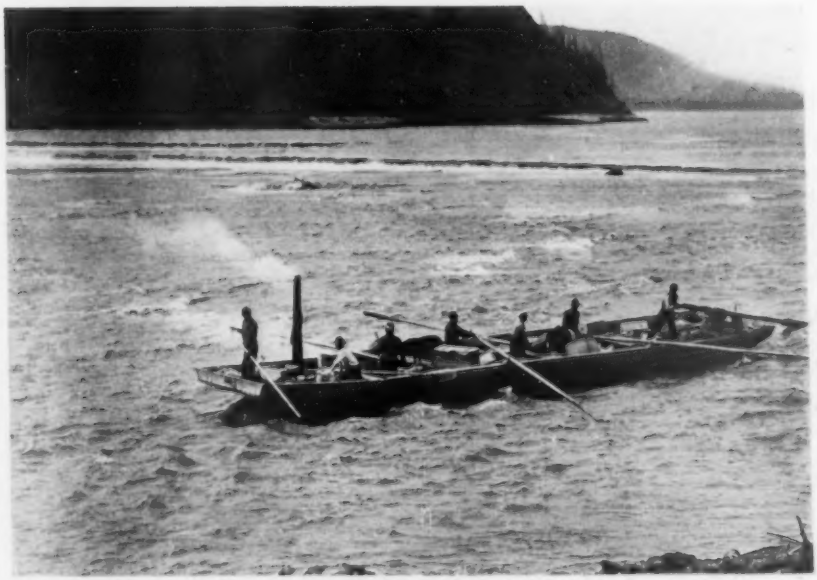

FIG. 19

FIG. 18—Tracking a scow up the Athabaska River. (Photo by Charles Camsell.)
FIG. 19—An Athabaska River scow below the Big Cascade. The Athabaska River scow is the type of boat commonly used on the Athabaska, Slave, and Mackenzie Rivers. (Photo by Francis Harper.)

The Plains Routes

For twenty years after the arrival of the first contingent of Lord Selkirk's settlers at the Red River, all the supplies for the colony came in from York Factory. In 1832, however, a considerable trade between St. Paul and the Red River settlements began to be conducted by private merchants who carted their goods overland. Finally in 1860 the Hudson's Bay Company also began to make use of the American railroads. A stage line was established between the town of St. Cloud on the Mississippi River and Georgetown on the Red River, and from Georgetown communication with Fort Garry at the junction of the Red and Assiniboine Rivers was effected by river steamer. Private traders were compelled to freight their goods overland from St. Cloud until 1871, when an opposition steamer began to make trips between Moorhead and Fort Garry. With the arrival of the Northern Pacific Railway at Moorhead in 1872 the new route to the Red River district became the important one, and a fleet of steamers and barges were soon engaged in the trade.

The new route resulted in making Fort Garry, or Winnipeg, the point of entrance to the Canadian West, and, as it increased in importance, York Factory proportionately declined. One by one the trading districts of the interior ceased sending their boat brigades to York and began to get their supplies through Fort Garry, until York became, what it remains today, merely the head post for the Hudson Bay district.

Red River Carts

With Fort Garry as the new headquarters, supplies were carried to the Western posts by cart brigades. In the year 1876 between four and five thousand carts were loaded at Winnipeg to cross the plains. The cart employed was a unique two-wheeled affair made entirely of wood and had the reputation of being able to go anywhere, no matter how rough the country. It was drawn by a single animal, either ox or horse, and carried on an average from eight hundred to one thousand pounds. One of its most characteristic features was its melancholy squeaking. The carts, often one hundred to a brigade, usually traveled in single file along trails that were followed year after year. In places along the more commonly used routes, such as the trails to Edmonton and Battleford, as many as twenty deep parallel ruts marked the course. From Winnipeg to Edmonton the distance by cart trail was 890 miles.

The Saskatchewan Steamboats

In addition to the Red River cart, another method of transportation came into prominence which further took the place of the York boat in freighting on the Saskatchewan. This was the river steamer. Between the years 1870 and 1886 seven large stern-wheel boats were built and operated on the Saskatchewan River carrying supplies from Grand Rapids as far as Medicine

Hat on the South Branch and Edmonton on the North Branch. These boats varied in length from 100 to 210 feet, and one of them was built of steel. Navigation was often difficult, owing to shallow water, shifting bars, strong currents, and stretches of swift water, up which the vessels had to be winched.

In the early years of the Saskatchewan steamers the cargoes were brought partly from York Factory and partly from Fort Garry by steamer up Lake Winnipeg to Grand Rapids, where they were portaged across on the tram-

FIG. 20—Tracking a scow up the Athabaska River. (Photo by Charles Camsell.)

way. At first the river steamers ran only as far as Fort Carlton or Prince Albert. From here the freight for the North country was carted overland to Green Lake, a distance of approximately one hundred miles, and then taken down the Beaver River to Lake Isle à la Crosse on the Churchill River and from there along the old York boat route to Methye Portage. Beginning in 1877, however, the steamer service was extended on up the Saskatchewan as far as Edmonton. In 1886 the long trips from Grand Rapids to Edmonton were abandoned owing to the shallowness of the river and the approach

FIG. 21—A Northern lake in June. Note the ice in process of disappearance. (Photo by F. J. Alcock.)

FIG. 22—Fort Chipewyan, an important distributing post of the Hudson's Bay Company at the western end of Lake Athabaska. (Photo by F. J. Alcock.)

of the railway to Prince Albert and Edmonton, from which places supplies were transported across the plains by carts. Though a few trips as far as Edmonton were made as late as 1891, very little navigation was carried on along the Saskatchewan from 1886 until 1904, owing to the advance of the railway and to the fact that settlement was taking place along it rather than along the river.

The Athabaska Routes

Mention has been already made of the different modes of transportation to Methye Portage and of the route from there down the Clearwater and Athabaska Rivers to Fort Chipewyan, the important distributing post of the North situated at the western end of Lake Athabaska. From it supplies were sent up the Peace River, down the Slave and Mackenzie Rivers, and east along Lake Athabaska to Fond du Lac.

An alternative route to Fort Chipewyan led from Edmonton on the Saskatchewan to the Athabaska River, a trail approximately 100 miles in length connecting Edmonton and Athabaska Landing. This would early have led to the abandonment of the Methye Portage route had it not been for the character of the Athabaska River between Athabaska Landing and Fort McMurray, situated at the junction of the Clearwater with the Athabaska. Immediately above Fort McMurray the Athabaska for a distance of about 90 miles is broken up into a series of rapids connected by stretches of smooth water. One of these, the Grand Rapids of the Athabaska, long presented greater difficulties than the Methye Portage, and it was not until an Athabaska boatman, Louis Faissonneuve, known on the river as "Captain Shott," demonstrated that a scow could safely be run down the Grand Rapids that the old route by the long portage became entirely abandoned. Henceforth all the supplies for the Northland came by way of Edmonton and Athabaska Landing. In 1891 the railway reached Edmonton, but it was not until 1912 that the freight train superseded the wagon on the trail from Edmonton to Athabaska Landing.

Method of Transportation

Transportation down the Athabaska was by river scows, boats built for drifting downstream. The Athabaska River scow is a flat-bottomed boat, having a length of 50 feet and a width of 12 feet at the top and 8 feet at the bottom. It is planked with inch lumber and calked with tar. A sweep 35 feet in length, balanced at the stern, is used for steering, and by it a single steersman can guide the drifting craft. Four oars, each 22 feet in length, are used for rowing when it is necessary to aid the steersman. While the Athabaska remained the important route to the north, as many as one hundred scows were run down annually from Athabaska Landing to Fort Chipewyan. As a rule the scows made but one trip, being broken up for lumber when they reached Lake Athabaska.

FIG. 23

FIG. 24

FIG. 23—Some tepees of Chipewyan Indians and the Roman Catholic Mission of Fond du Lac at the eastern end of Lake Athabaska. (Photo by F. J. Alcock.)

FIG. 24—A Cree Indian and his grandchildren, Cranberry Portage, Manitoba. The Crees, to the south of a rough boundary marked by Lake Athabaska and the Churchill River, and the Chipewyans to the north of it, constitute the two main Indian stocks inhabiting the Canadian Northwest beyond the settled belt. (Photo by E. L. Bruce.)

The first one hundred miles below Athabaska Landing the river flows smoothly, and the scow brigades could drift downstream steadily both day and night. A few rapids are then easily run, and another fifty miles brings one to the Grand Rapids of the Athabaska, where in a distance of less than one mile the river falls sixty feet. An island in the middle of the rapid divides the stream into a right and a left channel. The left has the greater volume of water but is so rough that canoes and scows never attempt it. Scows were run to the head of the island in the middle of the stream and unloaded. An experienced steersman with a picked crew at the oars and men at the bow with poles would then run the scow down the right-hand channel. A rope fastened to a log run out from the lower end of the island would be picked up by the men on the scow and the scow pulled up to the foot of the island. In the meantime the cargo could be portaged over the island by means of several small flat cars on a rough tramway. This miniature railway, which was maintained by the Hudson's Bay Company until 1915, not only transported all their own supplies over Grand Rapids Island, but turned in an annual profit to the company from the freight charges collected from other users.

Below the Grand Rapids, other rapids follow in swift succession; two of these, known as the Little and the Big Cascades, where the river drops over low limestone ledges, sometimes gave trouble to the scows in periods of low water. Arrived at Fort McMurray at the mouth of the Clearwater River, there were no more rapids to be encountered for the remainder of the journey to Fort Chipewyan. In fact, from Fort McMurray to the Arctic Ocean the only break that river steamers cannot pass is the rapids on the Slave River between Lake Athabaska and Great Slave Lake; a wagon road sixteen miles in length connects Fitzgerald and Fort Smith at the two ends of this rapid. As early as 1882 the Hudson's Bay Company had a steamer, the *Grahame*, on the lower Athabaska and since that time has maintained steamers on the Peace, Athabaska, and Mackenzie Rivers.

Recent Railroad Development

Just as the advance of the railroad on the plains in 1886 was largely responsible for the decline of steamer freighting on the Saskatchewan, so more recent advances have effected similar changes in connection with the Athabaska routes. In 1915 a line of railway from Edmonton reached the town of Peace River, and trade for the North began to go by way of the Peace instead of down the Athabaska. The Peace is the slightly larger river and, for a distance of 770 miles from Fitzgerald on the Slave River to Hudson's Hope above the town of Peace River, the only break to steamer navigation along its course is at Vermilion Chutes, about 300 miles below Peace River. Stern-wheeled steamers ply both above and below the Chutes, and a wagon road 4½ miles in length is used for teaming the cargoes from one steamer to another. It is interesting to note that the year 1914, which was the last year for the Athabaska scow brigades to take the northern freight to Fort

Chipewyan, was the year of the death of "Captain Shott" at Athabaska Landing.

A new line of railroad is once again to change the route to the Mackenzie River region. A railroad from Edmonton to Fort McMurray on the Athabaska River below all the Athabaska rapids is nearing completion. Communication will then readily be made by rail to Fort McMurray and from there by steamer to Fort Chipewyan and Fitzgerald. Fort McMurray will accordingly supersede Peace River as the rendezvous for the Northern trade just as the latter superseded Athabaska Landing in 1915, and once again the Athabaska River will become the route to Lake Athabaska and the Mackenzie River country.

The railway has also recently advanced into the North country in a different direction. In 1908 location work was begun by the government of Canada on a railroad to the shores of Hudson Bay. Since 1917 work on the road has been suspended, but at the present time the steel is laid to within 92 miles of the bay, and considerable progress has been made in establishing a terminal at Port Nelson at the mouth of the Nelson River near York Factory. A fortnightly train service is maintained at present from the town of The Pas over the line as far as Mile 214. It is hoped that the new Hudson Bay route will some day become one of the main trade routes of the Canadian West, giving an outlet to Europe for the grain fields of Western Canada.

In the regions where the railroad has not as yet penetrated, relics of the old methods of transportation are still encountered. The canoe as used by the North-Westers is still the common method of summer transportation as soon as one departs from the railroad or steamer routes. Though Norway House is now supplied by the Lake Winnipeg steamers, York boat brigades still ply on the Nelson and the Echimamish between Norway House and Oxford House. The Red River cart, on the other hand, has entirely disappeared. In 1912, when the Lord Selkirk Association celebrated the one hundredth anniversary of the arrival of the first contingent of Lord Selkirk's settlers into the Red River district, an effort was made to collect specimens of all the utensils and implements used by them. Among other things a Red River cart was desired, but search for one was made in vain from Winnipeg to Edmonton, and one had to be manufactured. Within the last few years, the Athabaska River scow has likewise become relatively a thing of the past, its place having been taken by the river steamer. The importance of the latter is increasing. On the Saskatchewan River since 1904 about twenty steam vessels of various sizes and types have been operated from local points, and at the present time about ten of these still operate, with the town of The Pas as their home port, being largely engaged in the traffic with the new mining region north of Cumberland House.

GERMANY'S LOST PACIFIC EMPIRE

By the late WILLIAM CHURCHILL

Chronology

1883 Annexation by Queensland of New Guinea east of the Dutch boundary at 141° E.

1883 Annexation annulled by Great Britain.

1884 October to December. Germany annexes Kaiser-Wilhelmsland (the northern shore of New Guinea east of 141° and inland to the central ranges) for the Deutsche Neuguinea-Gesellschaft, the New Britannia Archipelago (changing its name to the Bismarck Archipelago), and the Solomon Islands as far south as the strait between Ysabel and Malaita.

1884 November. Great Britain proclaims protectorate over British New Guinea (the southern shore east of 141° and inland to the central ranges), turning over administration to Australia, and over the southern Solomon Islands and the Santa Cruz group.

1885 August 25. German flag hoisted over Yap in the Caroline Islands. Spain protests the annexation, the matter being referred to the Holy See for arbitration.

1885 October 15. German flag hoisted at Jaluit in annexation of the Marshall Islands in the name of the Jaluit-Gesellschaft.

1885 Queensland re-annexes southeastern New Guinea.

1899 Germany buys from Spain the Carolines, Pelews, and Marianas.

1899 November 14. Germany completes the partition of Samoa on the dissolution of the Berlin General Act of 1889.

1914 September to December. Capture of Samoa by New Zealand, of New Guinea by Australia, of the equatorial islands by Japan.

Creation of a German Colonial Empire the Outgrowth of West German Industrialism in Opposition to Prussian Agrarianism

It is eminently characteristic of German administration that the very last item of acquisition of Pacific territory was really the first object of Germany's plans for her place in the sun. It was even more. The project for the annexation really underlies the whole German plan of creating a German empire. In the new government proclaimed at Versailles at the end of the Franco-Prussian War, the use of the term "empire" was in part braggadocio and in other part an attempt to establish a continuity of system with the Holy Roman Empire of the Middle Ages. That government was at the beginning, as at the end, a government of the more civilized Germanic states by Prussia. It was Bismarck and Prussia, the agrarian interest which could find its only active outlet in war, as opposed to the industrial and literary culture of the Rhine valley.

The point is one of extreme importance. The attitude of the German Empire toward colonies is not merely a matter of inference to be drawn from Bismarck's administration but is based upon the direct and positive statements of the Iron Chancellor himself. In the settlement of the terms of

the peace with France, it was proposed that Germany take over Pondicherry and the other French holdings in India and the Far East. Bismarck roundly denounced the project and swore that Germany not only needed no colonies but could not tolerate them.

Yet, there was another Germany which not even Bismarck could grind down. Even in the era of the Hohenstaufen emperors and popes there existed communities, city states, with full control over their own affairs and entirely free of the domination of clerical and feudal lords. These were the Hanseatic republics—Hamburg, Lübeck, Bremen, Riga, and the rest. They had established complete control over the trade of the North Sea and the

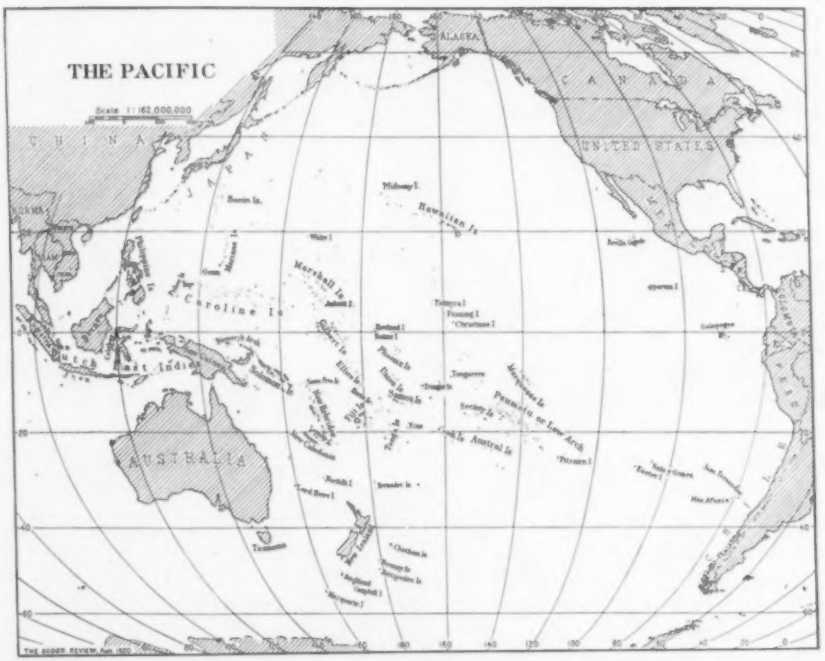

Fig. 1—Locational map of the Pacific islands. Scale, 1:162,000,000.

Baltic. They had settled themselves in London itself at the Steelyard and had so throttled England's commerce at its beginning that from their popular designation of "Easterlings" to this day the soundness of British finance must be stated in terms of the pound sterling. In the ordinary course of political events they found it necessary to associate themselves with their great and rude neighbor of Prussia on the east, for mutual protection. With Prussia they entered into the North German Confederation and joined with Prussia in the conquest of Schleswig-Holstein, of Bavaria, of Württemberg, and Austria, and eventually in the victory over France. The interests of the states of the Hanseatic League were overseas; their profit lay in procuring

the raw material upon which German craft and industry might exercise its constructive skill; their interest was none the less in finding a market for the product of German industry. Their capital must be fluid; their profit lay in the extent and frequency of the turn-over. Prussia, on the other hand, had no industry save that of farming—agriculture upon a great and feudal scale. Intimately as the Hanseatic League and Prussia found it necessary to associate themselves for purposes of government, their interests and objects were irreconcilable. Prussia was stagnant; Hamburg, type of its sister communities, had to exercise to live. It had to foster the development of the great industrial centers of the Rhine valley and the Palatinate, and that called for capital and yet more capital. It was inevitable that Hamburg should associate itself with the great banking interests which established themselves in Berlin after Frankfort had ceased to be the money center of northern Europe. Commerce and finance combined for the overthrow of Bismarck first, and eventually for the destruction of the empire of force which he had created.

The House of Godeffroy and the Acquisition of Germany's Pacific Colonies

One result of the effective blockade of the Southern seaports in our Civil War was to produce the cotton famine which, while advantageous to the valley of the Merrimac and southeastern New England, was ruinous to the English Midlands, the valley of the Rhine, and to the world at large. In all the warmer regions of the world every district in which cotton might be made to grow was exploited for the production of the great staple. The very life of Hamburg and Bremen and Lübeck depended upon the supply of cotton.

In Hamburg there was a merchant prince, Johann Cesar Godeffroy, merchant in the richest sense of the word, senator of the Golden Senate of his state. In search of cotton he sent out to the heart of the Pacific, to Fiji and Samoa, agents whose sole purpose was to establish plantations to relieve the dearth of Germany. The principal agent of the house of Godeffroy in the Pacific was Theodor Weber. Weber was a fit assistant to carry out the broad plans of his chief. His ability was recognized, first by his state, which created him Commercial Agent of Hamburg for the South Seas, and next by the North German Confederation, which appointed him its Consul, an honor which was carried over by the German Empire. Weber among savages beneath the palm trees, Godeffroy in Hamburg, manipulating a dream of world commerce, shared a vision—the vision of a German Empire which should establish itself in occupation of the Pacific Ocean. By reason of his daring extension of business Godeffroy brought his house into bankruptcy after a century and a half of great success; his mistake was in the exploitation of the Westphalian coal measures before German industry was ready to swallow the project. In the bankruptcy it was found that his South Sea operations were sound and paying, and these interests were

assumed by a joint stock corporation, Die Deutsche Handels- und Plantagen-Gesellschaft der Südsee-Inseln zu Hamburg. It is a matter of common note that a block of shares of this new company was allotted to members of the ruling family. The shareholders, under the leadership of the great Berlin banker Bleichröder, despite the opposition of Bismarck, forced through the Reichstag a subvention in aid of the new establishment. This was the beginning of the end of Bismarck, and in a few months the pilot was dropped; German business had won its first victory over Prussian militancy.

The Case of Samoa

It was not going to be easy for Germany to take over Samoa. Other interests were involved. The British colonies of Australia and New Zealand had established a lucrative trade. The United States since 1839 had the exclusive right to the establishment of a naval base in the harbor of Pagopago. The clumsiness of the execution of adroitly planned German machination in stirring up disorder among the Samoans actually brought the United States in 1889 to the point of the immediacy of war, a horror prevented only by the intervention of the gale which destroyed every ship in Apia harbor, except the British *Calliope*, which escaped by the merest thread. This led to a conference of Great Britain, the United States, and Germany in Berlin, resulting in the Berlin General Act, which undertook to provide a government for the Kingdom of Samoa and to protect it against the schemes of greedy nations.

It is for that reason that Samoa, the very best of Germany's colonial empire, remained the last territory to be annexed.

British and German Acquisitions in New Guinea

The colonies of Australia, now unified in the Commonwealth, felt pride in being outlying members of the British Empire, but for all practical purposes they regarded themselves as independent constitutional communities. In connection with the slave trade necessary for the working of the sugar plantations in tropical Australia, a trade which was allowed to exist under the more seemly designation of the labor trade, the colony of Queensland in 1883 annexed the eastern half of the continental island of New Guinea, whose mountain summits lay on the other side of the narrow Torres Straits. When this independent act of the colony was reported in London Lord Derby at once disavowed the act of sovereignty on the ground that a colony had no right to annex territory to itself. This created a storm, not only in Queensland, but in the other colonies of Australia, and public meetings of protest were held in Brisbane, in Sydney, and in Melbourne, and all the colonial parliaments passed various measures complaining of this invasion of their rights. Germany seized the opportunity and, in the last months of 1884, annexed the northern shore of New Guinea from the Dutch boundary eastward to Dampier Strait and the territory back of it theoretically to the crest of the central range of mountains. This was done, not as an imperial act,

but as the placing in possession of the land of Die Neuguinea-Gesellschaft, imitative of the British chartered companies in South Africa and in Borneo. Continuing the annexation, but this time as imperial, the expedition assumed the whole of the New Britannia Archipelago and of the northern Solomon Islands as far south as the strait between Ysabel and Malaita. At once Australia was ablaze, and London, yielding at last to the popular sentiment of its great southern dependency, annexed the southern shore of New Guinea and turned it over to Australia for administration; and in the islands Great Britain established a protectorate over the southern Solomons and Santa Cruz.

German Acquisition of the Carolines, Marshalls, Marianas, Pelews, and Samoa

In August, 1885, still in extension eastward in the Pacific, Germany performed an act of annexation over the island of Yap in the Carolines. This group was claimed from the earliest discovery period by Spain, which protested the annexation. By agreement, the matter was referred to the Pope for arbitration, who eventually decided that the title lay with Spain. In October of the same year Germany hoisted its flag over the Marshall Islands, not as an imperial act, but in the form of another company, the Jaluit-Gesellschaft. In 1898 the United States had first captured and then bought from Spain the Philippines and the island of Guam in the Marianas. The following year Germany bought from Spain for 24,000,000 pesetas the remainder of its now useless Pacific holdings, the Carolines, the Marianas, and the Pelews (German, Palau). Toward the end of the same year, following the war upon the death of King Malietoa, the Berlin General Act was annulled by consent of the three nations and Samoa was distributed: Tutuila to the United States; Upolu to Germany; Savaii to Great Britain. Immediately Great Britain and Germany adjusted the tangle of other affairs in the Pacific, Germany receiving Savaii and in return making various concessions to Great Britain in the Tonga and the Solomon Islands.

Status of Colonial Dominion in the Pacific in 1900

Thus, with the end of the century an equilibrium was struck in the tropical Pacific. France was in possession of the Society Islands, the Marquesas, and the Paumotus in the extreme east and of New Caledonia and the Loyalty Islands in the west, together with the insignificant missionary property of Uea and Fotuna in the center between Fiji and Samoa, and a joint administration of the New Hebrides shared with Great Britain. The British Empire held, either as protectorates or by direct annexation, the greater part of the Solomon Islands in the west, Fiji and Tonga in the center, and north of Samoa toward the equator the Tokelau (Union) and Gilbert groups, together with an abundance of scattered and less important islands. Germany held Samoa in the center and along the equator extensive possessions in New Guinea, the Bismarck Archipelago, the Pelews, the Marianas, the Carolines, and the Marshalls. The United States had Tutuila in Samoa to the south, Hawaii to the north, Midway and Wake Islands in the open sea, Guam in

the Marianas, and the Philippines. The interests of these great powers fall into two distinct groups. Great Britain, France, and Germany exploited their possessions in the Pacific in the interest of commerce and productive agriculture; the United States was and is interested solely in the maintenance of unimpeded communication between its great outpost of Hawaii and the Philippines. These great powers differ in their holdings in another and most important regard. Great Britain, France, and the United States are in a position to control the passage through the East Indian archipelago. Germany has been unable to obtain a foothold in the Malay East.

Changes of Ownership in 1914 Owing to the War and Their Strategical Significance

This condition of equilibrium existed for thirteen and one-half years. Then came the war. New Zealand on its way to the Mediterranean took German Samoa without resistance. The forces of the Commonwealth of Australia gathered the German Solomons and the Bismarck Archipelago and were occupied for several months in quelling German opposition in New Guinea. Neglecting for the time the strong fortification Kiaochow, the Japanese picked up the equatorial possessions of Germany from the Pelews to the Marshalls. Under the unusual designation of mandataries, the possession of these several members of the former German empire of the Pacific remits to New Zealand, to Australia, and to Japan.

It stands clear among the problems of the greater strategies that no Atlantic power can afford to fight for the possession of any Pacific holdings; that no Pacific power can afford to let them go. Thus, there was no attempt on the part of Germany to make any determined effort to hold its Pacific empire; it was content to let it pass to enemy hands at the beginning of the war, knowing that the eventual fate must rest in the outcome of the war as fought in Europe. The British Empire in assuming its share of the former German possessions is in a dual position. As Great Britain, an Atlantic power, it can have no need of these islands; but constituent members of the empire, the Commonwealth of Australia and the Dominion of New Zealand, are essentially Pacific lands at the present and inevitably will develop to a position of greater importance in that regard. It is, therefore, eminently fitting that these two constitutional states should assume the control of the contiguous Pacific area.

The Present Position of the United States in the Pacific

The position of the United States in the Pacific was in no sense threatened by Germany in the war; Hawaii and Samoa at the east and Guam and the Philippines at the west were not the object of German attack, and, superficially, it may seem that they are not affected by the distribution of the German islands in the Pacific. It is to be noted, however, that the equatorial islands from the Marshalls to the Pelews are parallel to an important American line of communication, namely that from Hawaii to the Philippines. The lines are not exactly parallel, but sufficiently so for practical

purposes. At the east Jaluit lies about 500 miles to the south of the American line of communication, a distance which in modern warfare we have learned is to be covered in a very scanty tale of hours; toward the west the distance is reduced to 47 miles, that being the interval between American Guam and Rota, the next island in the Marianas, a distance now within the easy scope of modern artillery. Fortunately for the security of our line of communication, these islands have no harbors of a character to serve as bases for capital ships. They do abound, however, in smaller bays and roadsteads, each of which might serve as a store base to be used only once, or to be sacrificed without great loss, by an enemy at the beginning of any war which shall engage in any activity in the Pacific. They would serve equally as ambush for destroyer units prepared to harass our fleets advancing along the great circle to the westward. A particular element is introduced in these equatorial islands by the frequency with which the atoll type recurs. There are hundreds of these islands in which a narrow wall of sand surrounds some considerable areas of water in an inner lagoon and protects it from the oceanic wave movement. There are thus many excellent possible bases for hydro-airplanes with abundant surfaces of smooth water giving an ideal take-off. The late war has shown the great prospect of value in offence which may be expected from airships of this type. The number of these bases is such as to entail a most considerable difficulty upon the commanders of any fleet which attempts to search them out and to clean them up, for the assault upon a vessel having the freedom of the skies presents a task of conspicuous difficulty to a vessel confined to the water.

Along the same track lies another American line of communication and a fixed one. The Pacific cable of the Commercial Cable Company is carried along the bottom of the sea from Hawaii to a relay station at Midway and a point of general distribution at Yap in the Carolines. From Yap an American branch line extends northward to the Bonin Islands, where it connects with the Japanese line with Tokyo. At Yap another connection is made with British lines to the China coast; the American cable extends to Manila, and other connections are made with New Guinea and with Menado on the Gorontalo Peninsula of northern Celebes. These points, which mark out the course of cable distribution, are equally central points in the network of radio communication across the Pacific.

Conclusion

Such is the situation in the South Seas at the end of the war. The period of annexation of these several empires in the Pacific passed over without violence other than intemperate speech. This was followed by a period of equilibrium which was not disturbed by any set of circumstances existing in the Pacific but entirely by conditions whose cause and origin was in Central Europe. The German empire of the Pacific has been wiped out, and new states of control have been established. A new balance has been struck. The future alone can disclose whether a state of stable equilibrium has been reached.

GEOGRAPHIC INFLUENCES IN THE DEVELOPMENT OF THE MENHADEN FISHERY ON THE EASTERN COAST OF THE UNITED STATES

By RALPH H. GABRIEL

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It is the conflict between the land and the adjacent sea that dominates the development of a coast area. In the coastal zone two forces are always at work, usually in opposite directions. If the ocean is productive, a pull is set up which tends to draw the shore dweller away from land and out to sea. If, on the contrary, the country that stretches back from the beach is rich in agricultural or other resources, a counter pull is developed which tends to keep the shore dweller off the ocean and even to draw him inland. Almost every degree of balance and lack of balance is to be found between these two conflicting influences.

There are many cases, however, where the forces of land and water, instead of working in conflict, are actually in harmony. Many times the coast zone and even the hinterland is so unproductive that the man who lives near the shore finds that the land, instead of drawing him away from the water, is steadily pushing him toward it. In contrast to such areas are those where storms, currents, and a forbidding coast line conspire to drive even the most hardy toward the interior. Midway between these two great forces of land and sea, whether they be in conflict or in harmony, lives the shore dweller, his life, to a large extent, the record of the varying fortunes in the eternal struggle between the two dominant forms of the earth's surface.

Neglect of the Menhaden in the Colonial Period

Many an older Long Island resident still lives along the shore of Peconic Bay or Great South Bay who well remembers the time when the menhaden came so frequently to those waters. He can recall the sudden appearance of vast schools of these fish, sometimes hundreds of thousands of them, rushing into the shallow off-shore waters, pursued, perhaps, by some of their voracious enemies, the sharks or the blue fish. The coming of these menhaden, swimming just under the surface of the agitated water, presented a spectacle indeed. From time immemorial these fish have migrated in the months of summer from their winter haunts in southern waters or in the deep sea to cast their spawn in the sheltered coves and inlets of the northern coast. Booth Bay and Cape Ann, Narrangansett Bay and Long Island Sound, the Jersey coast, Chesapeake Bay and even Cape Hatteras are the regions to which they have been wont to come. It was in these bays and estuaries that the menhaden fishery began.[1]

[1] The standard work on the menhaden fishery for the period it covers is G. Brown Goode: The Natural and Economical History of the American Menhaden, Appendix A (=pp. xii + 1-529, with 31 plates, including map of fishing grounds and oil factories, mean scale 1:13,700,000), *Rept. of the Commissioner of Fish and Fisheries for 1877*, Washington, D. C., 1879.

There is a saying among some students of society that man adapts himself to his environment, not so much as it is but as he thinks it is. The traveler among the coast people of New England or Long Island at almost any time during the century and a half of the colonial period would have found a striking illustration of this. To the shores on which these people lived came annually vast schools of menhaden which were allowed to go away again with scarcely a net drawn to catch them. The local fishermen used a few for bait, but there was little more than that. The "mossbunker" was not a food fish and, therefore, was considered valueless. The beginning of the fishery must, on this account, await the time when some important need should arise which the menhaden could satisfy.

Discovery of Value as Fertilizer

By the end of the eighteenth century scanty crops and thinning meadows began to tell the story of the exhaustion which had come to the farm lands of New England and the isolated peninsulas of eastern Long Island. Exploitative and unscientific methods of agriculture had borne their inevitable fruit. For a century and more, the means for replenishing the soil had been at hand, unused and apparently but little thought of. In 1801, however, when the damage had been done and the situation had become serious, Ezra L'Hommedieu, a Long Islander and one of the small group of pioneer leaders in the first American movement for better agriculture, published[2] his conclusions, based on experiments of his own and others, on the possibility of using the menhaden as fertilizer. This was the beginning of new things for Long Island. Three years later President Dwight of Yale College described[3] the change that had come over this region. "Their agriculture has within a few years been greatly improved. . . . . The inhabitants have swept the Sound and covered their fields with immense shoals of white-fish, with which, in the beginning of summer, its waters are replenished. No manure is so cheap as this where the fish abound." Eight thousand of these menhaden, worth from $1.00 to $1.50 a thousand, were required to dress an acre of land. As the farmers awakened to the profits to be derived from the new fertilizer, the fishery grew. Scarcely a year passed without making a new record in the number caught. By the middle of the nineteenth century, the business had reached such proportions that "at least one hundred million" fish were "annually taken for this purpose." It was to rejuvenate a worn-out soil, therefore, that the long neglected "mossbunker" became valuable, and, as a consequence, the menhaden fishery, during its first period of development, was dependent upon the requirements of the new agriculture of the early nineteenth century. Better farming and bigger catches went hand in hand.

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[2] *Trans. New York Soc. for the Promotion of Arts, Agric., and Manfrs.*, Vol. 1, 1801, pp. 65–67.

[3] Timothy Dwight: Travels in New-England and New-York, 4 vols., London, 1823; reference in Vol. 3, p. 305.

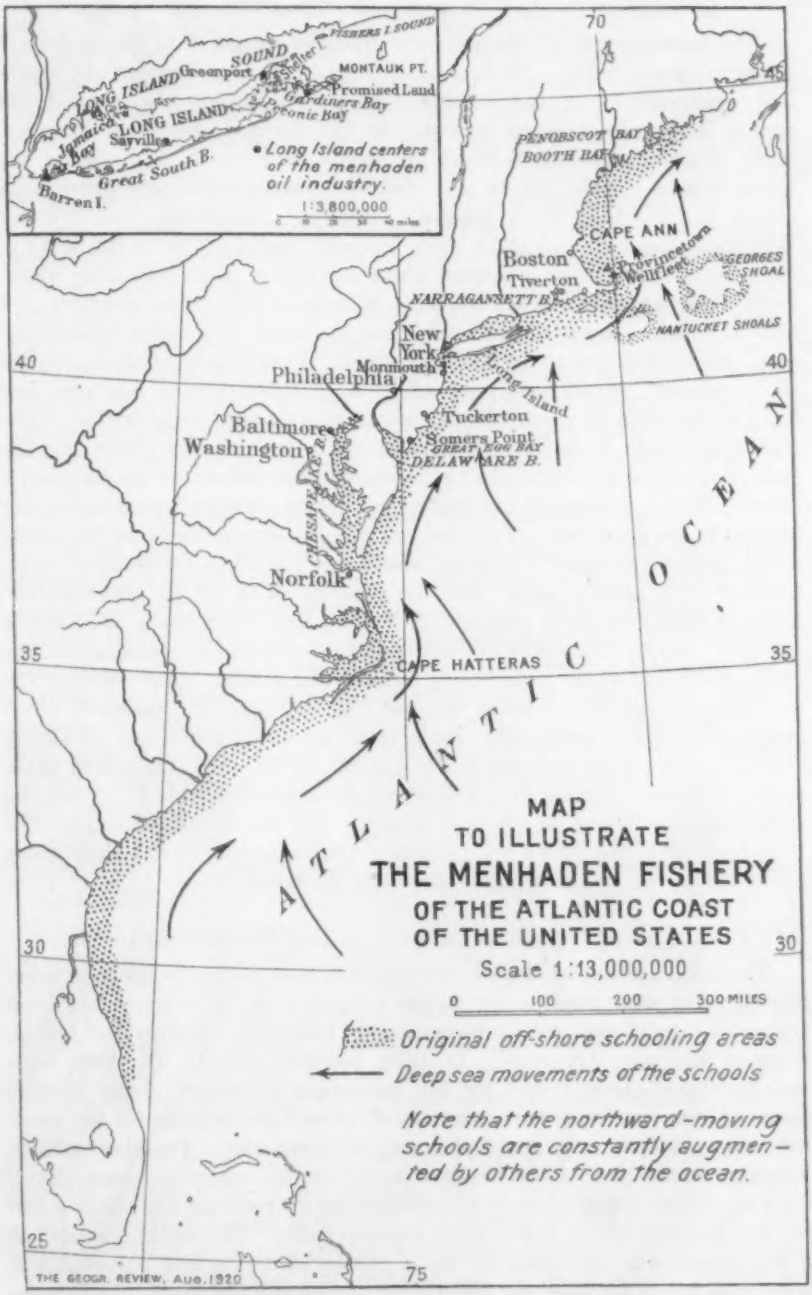

FIG. 1—Map showing the menhaden schooling areas (after G. Brown Goode) and the deep-sea movements of the schools. Scale 1:13,000,000. The inset, 1:3,800,000, shows the centers of the menhaden oil industry on Long Island.

Menhaden Fishery During the "Agricultural" Phase

The organization of the menhaden business during this "agricultural" phase was a simple one. The first fishermen were, mainly, farmers who organized "companies" to go out in boats to capture the schools when they should appear in the neighboring waters. As the demand increased, however, many of these associations began to devote their whole time, during the fishing season, to the taking of "bunkers." Known by such picturesque names as "Coots," "Fish Hawks," "Eagles," "Pedoodles," or "Water Witches," they began to ply a lively business, and, by 1860, a full score of them were to be found scattered along the shores of Peconic Bay alone. Each "company" owned a huge seine, sometimes fully three quarters of a mile in length. A small board shack on the beach was called "headquarters," and in this the equipment was stored. Upon the sighting of a school the "company" would hastily put off in large, sharp-pointed rowboats and bend to the oars to reach the fish ahead of any rival organization. The menhaden would be quickly surrounded, the net put into the water, and the ends of the great seine brought to the shore in the vicinity of the company's house. Horses, harnessed and waiting at the water's edge, would be quickly hitched to the great ropes of the net, and the fish drawn slowly to the beach, a huge pile of glistening "bunkers," sometimes a hundred thousand or more. Catches were usually large, and the business, with all its uncertainties, seems to have been fairly profitable. Putting away their boats, the "Water Witches" or the "Fish Hawks" would begin immediately counting out the catch, to be sold to the neighboring farmers who flocked to the water at the first news of the haul. When the last "lumber wagon," loaded to overflowing, had jolted away into the interior, the great net would be slowly wound up on a giant reel and left in the sun to dry while the watch again began his lookout for the disturbed water above another school. It was the simple organization of an off-shore fishery. The fish were both caught and used near the beach, and a few fishermen were beginning to risk their whole livelihood in the new and highly uncertain vocation.

Discovery of Value of Menhaden for Production of Oil

The middle of the nineteenth century brought a change to the menhaden fishery. For some time, a few people interested in the business had been trying with indifferent results to extract oil from the "bunkers" by boiling them in whaler's "try-pots." In 1850, however, Mr. D. D. Wells built near Greenport, Long Island, the first menhaden oil factory on the Atlantic shore. Great success did not immediately attend this venture, for the product was of a dark color and had a very offensive odor. Persistent efforts, however, on the part of Mr. Wells in improving his machinery soon developed an oil that began to come into general use for painting and tanning and for the adulteration of other, more expensive oils. The refuse, "scrap" as it was called, was also utilized. By a process of drying and pulverizing it was made into a fertilizer and distributed among the farmers of the Eastern

States as "guano." The new uses for the menhaden products brought an end to the "agricultural" phase of the fishery. Such inroads were made in his supply that the farmer, finding so many of his fish diverted to other purposes and the "guano" too expensive for universal use, was compelled to bestir himself to a search for other sources whence fertilizer might be derived. The high prices of the Civil War period brought prosperity and also many competitors to the Wells enterprise. Instead of one nearly a score of small "factories" began to consume the catches made by the fishing companies. The oil business, however, was promptly overdone. The resulting elimination of the less fit speedily reduced the number of Long Island enterprises to ten. Built on out-of-the-way stretches of the beach, where their pungent odor would offend as few as possible, these crude establishments, scarcely more ambitious than the "headquarters" of the "Coots" or the "Water Witches," began to employ a considerable number of people and to stimulate the "bringing up of a hardy race of boatmen and sailors." The factory did not at first absorb the older fish companies but attracted new people to the shore. It was the measure of the increasing influence of the sea.

Change from Off-Shore to Deep-Sea Fishery

By the middle of the nineteenth century another change in the menhaden fishery had begun to manifest itself. Fifty years of uninterrupted capture had made the "mossbunker" wary, and schools came less frequently to the shallow waters of the coast. The catches of the seining companies became fewer and fewer. As a consequence the fishermen began to seek the fish farther out. Sloops and schooners of sometimes twenty tons swept the waters of Gardiner's Bay, Long Island Sound, and beyond. Because the new style of fishing required a new equipment the purse net was developed. When a fishing schooner sighted a school, two open rowboats would put off and swiftly lay the net in a circle about the fish. While the top of this floated at the water's surface, the bottom edge would be quickly "shirred" together with the long ropes intended for that purpose until the "bunkers" found themselves enclosed on every side. The vessel would then tack alongside and, with a scoop net, the catch would be transferred to the great storage tank in the boat. Although some of the old seining companies remained, the day of their importance was passing, and the more energetic among them abandoned the beach for the new style of fishing on the broad ocean. Menhaden fishing, which had called many men to a new occupation at the water's edge, was now steadily drawing many of these out to the open water as the business shifted from an off-shore to a deep-sea fishery.

The Disappearance of the Independent Fisherman

The advent of the oil factory came just at this time of change. The factory, because it was an outgrowth of a fishery already established, sent at first no fleet of its own to sea but was content to buy at its docks the catch of the fishing companies and crews already in the business. In this sense

the first factories were dependent upon the fishermen. To ensure as steady and as large a supply of "bunkers" as possible some owners developed "floating factories," hulls of old ships remodeled and equipped with the requisite apparatus. These could be towed up and down the shore, saving time and expense by following the movements of the fish. The primitive floating factory, an adaptation to the off-shore phase of the fishery, was, however, but temporary. It disappeared with the disappearance of the fishing in shallow water. As the floating factory dropped out, its competitors on the beach grew in size and number. It was inevitable that the owners of these should begin to chafe at their dependence upon the fishermen, over whom they had no control. As the organization of the business required the manufacturers to compete with one another in buying "bunkers" for their presses, it was but natural that the more energetic among them should take steps looking toward the catching of their own fish. Within fifteen years after the founding of Mr. Wells's first establishment, a majority of the oil-making companies were sending their own fleets to sea, with orders to push their prows southward far down the coast and to follow the great menhaden schools in their migration to northern waters. With this change practically came the disappearance of the independent fisherman. He now became one of many elements in an organization steadily growing larger and more complex.

The "Factory" Phase of the Fishery

During the first three decades of the "factory" phase of the menhaden business a multitude of small oil-making establishments, costing from $10,000 to $40,000, appeared along the north Atlantic shore. By 1877 the coast of Maine could boast fourteen factories of sufficient importance to be represented in the Maine Oil and Guano Association. Narragansett Bay supported thirteen concerns, of which nine were located at Tiverton. Farther to the west, five more dotted the Connecticut shore. Another five prosecuted their business on the Jersey coast at Somer's Point and Tuckerton. Four factories were scattered along the Chesapeake from Norfolk to Baltimore. Even at this time, however, when the business reached its greatest regional expansion, Long Island, with its multitude of shallow bays and sheltered harbors, was the most important center. The first ten factories of the pioneers had increased to fifteen on the beaches of the eastern end, with eight more on those of the southern shore. Although, here and there, an isolated plant could be found, the bulk of the Long Island establishments were claimed by three centers, Barren Island in Jamaica Bay, Sayville on Great South Bay, and, most important of all, Greenport and Shelter Island on Peconic Bay.

Change from Sailing Vessels to Steamers

During the period of multiplication of small factories occurred a change which was destined to alter profoundly the development of the industry. The steady decrease of the number of schools coming into the off-shore

waters and the consequent constant lengthening of the voyages down the coast overtaxed the powers of the sailing vessels. The amount of labor required and the speed with which a very perishable product must be brought to the factory from more and more distant fishing grounds were the factors that inexorably marked out the limits of usefulness of the sailing ship. Fish must be brought from grounds scores of miles from the factory and must not be allowed to spoil. The advent of steam was inevitable. The change, however, would cause nothing less than a revolution in the industry. The small oil manufacturer of the seventies could rarely afford to purchase and maintain a menhaden steamer, which, in many cases, would cost more than his entire factory. He usually had neither the capital nor the volume of business to warrant the purchase. The exigencies of deep-sea fishing, however, could not be avoided. The steamer was forced upon him. The result was consolidation of the factories. By 1895 the sailing vessel had been practically driven from the water, and the twenty-three Long Island factories of 1877 had been reduced to eight. Some of these were still located on Barren Island and the rest at a new center, the treeless isthmus of Promised Land. These larger concerns, with their improved equipment and fleets of small steamers, marked the beginning of the phase of the menhaden fishery characterized by highly intelligent adaptation to the peculiarities of the environment. Instead of waiting for the fish to come to the shallow waters of the shore, eager mariners drove their vessels farther and farther to the south whence the northern migration began. Every stretch of water where any menhaden might be found was carefully scanned again and again. The sea had not only drawn the fisherman far out from land but had completely changed his method of work. The movement toward consolidation fostered by the demands of the new deep-sea fishing was, however, not yet completed.

The Consolidation of the Industry

On the morning of November 19, 1897, when the people of Greenport picked up their local paper, those interested in the menhaden fishery were dismayed to read the following announcement,[4] which came without the slightest warning:

> A syndicate composed of English capitalists is negotiating for the purchase of the menhaden business at Promised Land. It proposes to buy the factories and the entire outfit, thus securing entire control of the menhaden business on eastern Long Island, and not only does this syndicate hope to obtain control of the Promised Land works, but it has also negotiated for the purchase of the National Oil and Guano Manufacturing Company, which has an office at Maiden Lane, New York, and is regarded as one of the most influential in the business. In fact, it is believed that the syndicate proposes to corner the entire menhaden business of the Atlantic coast. The capitalists have offered the owners of the factories the privilege of selling out their business to the syndicate at a fair price or else run the risk of being frozen out, as they claim this will ultimately come, in due course of time. If the owners of the factories will not sell, the capitalists will then undertake the process of freezing out the individual owners. In

[4] *The Long Island Traveler*, Nov. 19, 1897.

order to do that they will secure a desirable harbor frontage, in the vicinity of the present factories, and then proceed to business. The capitalists claim to control a patent by which they can manufacture menhaden fertilizer with one third less expense than is incurred according to the present method. In this manner they propose to freeze out the present owners, if they will not sell.

This sudden assault upon the prosperous menhaden business brought consternation to the people. Disquieting rumors ran from village to village along the coast. "Fishermen are asking what the syndicate is. Is it the Standard Oil Company, the sugar trust, or an English syndicate?" Would the Maine and Rhode Island factories sell out? Families whose support depended upon the business became fearful that, in the event of a change, things might not fare well with them. Deep indignation at the cold-blooded attack appeared in every quarter. Behind closed doors the factory owners considered the situation in all its aspects. They understood that they were face to face with a corporation whose capital was reported at ten millions of dollars and which was armed with an invention that would enable it to undersell the most efficient of the local manufacturers. It was intimated to them, that, in the new concern, American as well as British money was involved and that the Standard Oil Company, wishing to turn certain of its waste products into a profitable lubricating grease by the addition of cheap menhaden oil, was the American firm interested. From November until February the owners considered the proposal. On the twenty-fifth of the latter month all the important concerns yielded to the inevitable, and, on that day, was consummated the final transfer of their properties to the American Fisheries Company. Together with those of Long Island went practically all the factories of the Atlantic coast. With this event the movement toward consolidation which had begun far back in the seventies reached its dramatic culmination.

Concentration of the Menhaden Oil Industry on Long Island

The problem which, at the outset, confronted the American Fisheries Company was of a distinctly geographical nature. Where should the large, new factories of the concern be located? The dominant factor in the problem was the annual migration of the menhaden schools from the warm waters of the Gulf region up the Atlantic coast as far as Maine, a great north-flowing river of fish running roughly parallel to the Gulf Stream. The company decided to establish four oil-making centers from which steamers could be sent out to tap this living stream. Delaware Bay, at the south, Promised Land and Tiverton in the center, and the coast of Maine at the north were the locations chosen. Besides these, an experimental factory was to be established on the Texas coast to try the possibilities of winter fishing in the Gulf of Mexico. Apparently because of its central location and its nearness to New York, Promised Land was chosen for the headquarters of the company. The winter quarters for the fleet were sometimes at Greenport and sometimes at Tiverton across the Sound. The new com-

pany abolished competition. Frequent long voyages, the purpose of which was to outdo rivals, were no longer necessary. The concern arranged its plants so that the river of fish could be divided into three segments, the northern, the middle, and the southern. Factories were located with reference to these divisions. The small factories that had succumbed gave way to large plants, and highly improved steamers brought a greatly increased catch to the storage tanks on shore. It was the last step in intelligent adaptation to the peculiarities of the maritime environment. The only question was whether the supply of menhaden would hold out in the face of such enormous inroads.

The reasons which had led to the concentration of the great menhaden oil business of Long Island into one small locality at Promised Land were significant of certain important developments in the life of the island. In the days of the early oil factories establishments had been scattered at irregular intervals along the whole shore from Greenport to Jamaica Bay to utilize the fish which came to all those waters. By 1890 most of these concerns had moved to Promised Land in the east and Barren Island in the west. After the coming of the American Fisheries Company the Barren Island factories were given up, and the whole Long Island business was carried on at the eastern station. There was another reason for this change, aside from the shifting of the fishery to the deep sea. An exceedingly offensive odor of decaying fish arises inevitably from the menhaden manufacturing establishment. Unpleasant as this was, the factory of the early days, built on an out-of-the-way part of the beach, was allowed to stay because many of the men and women of the locality were dependent upon it for their living. When, however, the summer people of New York began to come to the beaches of Long Island in sufficient number to make them valuable, the situation was changed and a struggle was precipitated between the factory owner and the inn keeper. First to feel the new influence was beautiful Shelter Island, from whose beaches the factories were expelled as early as 1872 by the strong arm of the law, acting avowedly in defense of public health. The story of Shelter Island was that of the whole Long Island coast. Everywhere health officials began closing down or driving out the factories as fast as the local inhabitants entered into the business of caring for the vacation people from the city. The question presented to the factory owner was where to go. Promised Land, a narrow bleak isthmus of sand with the sea pounding at either side, a land of no farms, no villages, and no summer people, offered a safe retreat and refuge. Attractive from its very unattractiveness, set far out upon the Montauk peninsula, near which flows the great menhaden stream, a railroad skirting its beach of sand dunes and finding a terminus a scant hundred miles away in the greatest industrial center in America, Promised Land formed the ideal location for the maker of fish oil. To this center ultimately gravitated the whole of Long Island's great business, and here the American Fisheries Company established headquarters. At least one section of the "Long Island barrens" had come into its own.

Conclusion

The menhaden fishery is relatively unknown. It has little of the romance of whaling, and it requires little of the hardihood demanded in the quest for cod off the Newfoundland Banks. There is scant material in this business of the sea with which to stir the imagination, yet the story of the development of this fishery is not without value. The shore line is the greatest boundary line in the world and the coast area the world's greatest zone of transition. Perhaps this story of the development of an obscure fishery which does not consider the sea in its more famous rôles of the great barrier, the busy highway of commerce, or the source of almost limitless food supply will serve to point out the multiplicity of ways in which the ocean influences the life of the shore dweller and the silent power of that influence when once it begins to operate. Most people think of the coast line from the Gulf of Mexico to the Gulf of St. Lawrence as the eastern edge of the United States and fail to realize that it is also the western rim of the Atlantic Ocean. It is the middle zone between the two, typical of neither, and the life of its people is the resultant of the interplay of the two greatest natural forces that the world knows.

THE ZOÖGEOGRAPHY OF NORTHWESTERNMOST SOUTH AMERICA (AFTER CHAPMAN)

By CHARLES C. ADAMS

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Modern botany and zoölogy, in their emphasis on ecology, or the environmental relation, rather than on the taxonomy, or classification, stressed by the older school of thought, closely approach the geographical viewpoint. Works composed from this standpoint therefore generally afford much of value and interest to the geographer. One of the most noteworthy among recent publications of this kind is Chapman's "Distribution of Bird Life in Colombia."[1] It is a report on an unusual biological survey—unusual, because its purpose, as the author states, was not to find new species of birds but mainly "the discovery of the geographic origin of South American life." The collections upon which the study is based were secured during a period of more than four years by expeditions from the American Museum of Natural History which were confined to the Andean region of Colombia.

The detailed notes on Colombian birds which form the bulk of the work (Part II, pp. 170–639) are preceded by introductory chapters illustrated by well-chosen photographs and maps (Part I, pp. 3–169). These chapters contain a review of the status of knowledge of Colombian ornithology, a general description of the routes followed on the Museum's eight expeditions, a summary of the topography, climate, and vegetation of the region, and—the culmination of the investigation—a discussion of the distribution of animal life in vertical "life zones" and its relation to the problem of the origin of South American life. This discussion, which consists of two parts, general conclusions (pp. 84–93) and individual characterizations of each life zone (pp. 93–169), is illustrated by the two colored maps which are reproduced in black and white herewith (Figs. 1 and 2).

The Vegetational Areas

Vegetation is recognized as the primary factor in animal distribution. Four types are distinguished, as follows (Fig. 1): mountain forests; tropical zone forests; unforested areas; and llanos. The dense tropical forests are clearly determined in the main by the low altitude, high temperature, and heavy rainfall. The lowland open areas are due to drought. The llanos are covered with tall grasses and scattered bushes and extend as strips along streams subject to much overflow. The arid regions of the upper valleys of the Magdalena and Cauca Rivers are, according to Hettner, due in part to a porous soil, to drought, and to high temperature. The upper Cauca valley has probably been cleared considerably. The mountain forests are

[1] F. M. Chapman: The Distribution of Bird-Life in Colombia: A Contribution to a Biological Survey of South America, *Bull. Amer. Museum of Nat. Hist.*, Vol. 36, 1917, pp. 1-729.

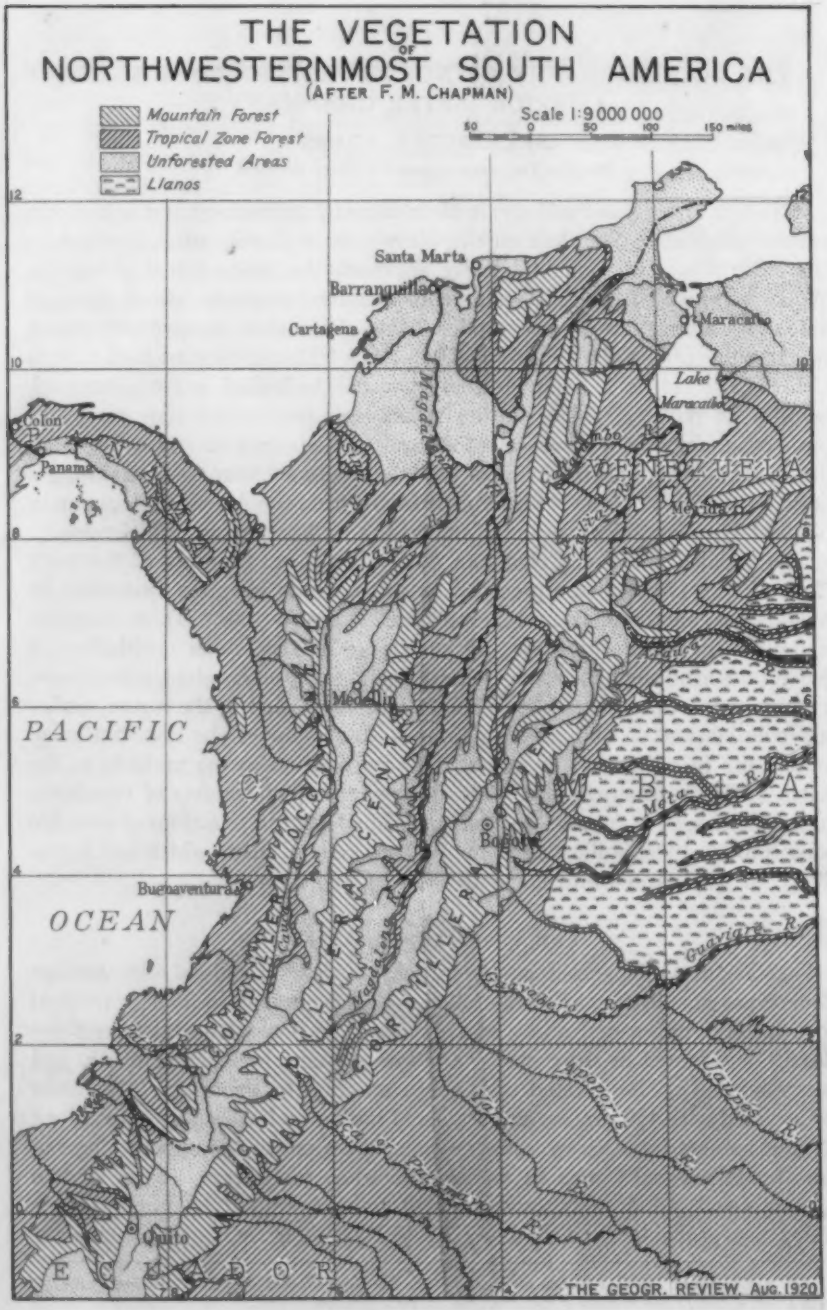

FIG. 1—(Sierra de Perijá region modified after de Booy)

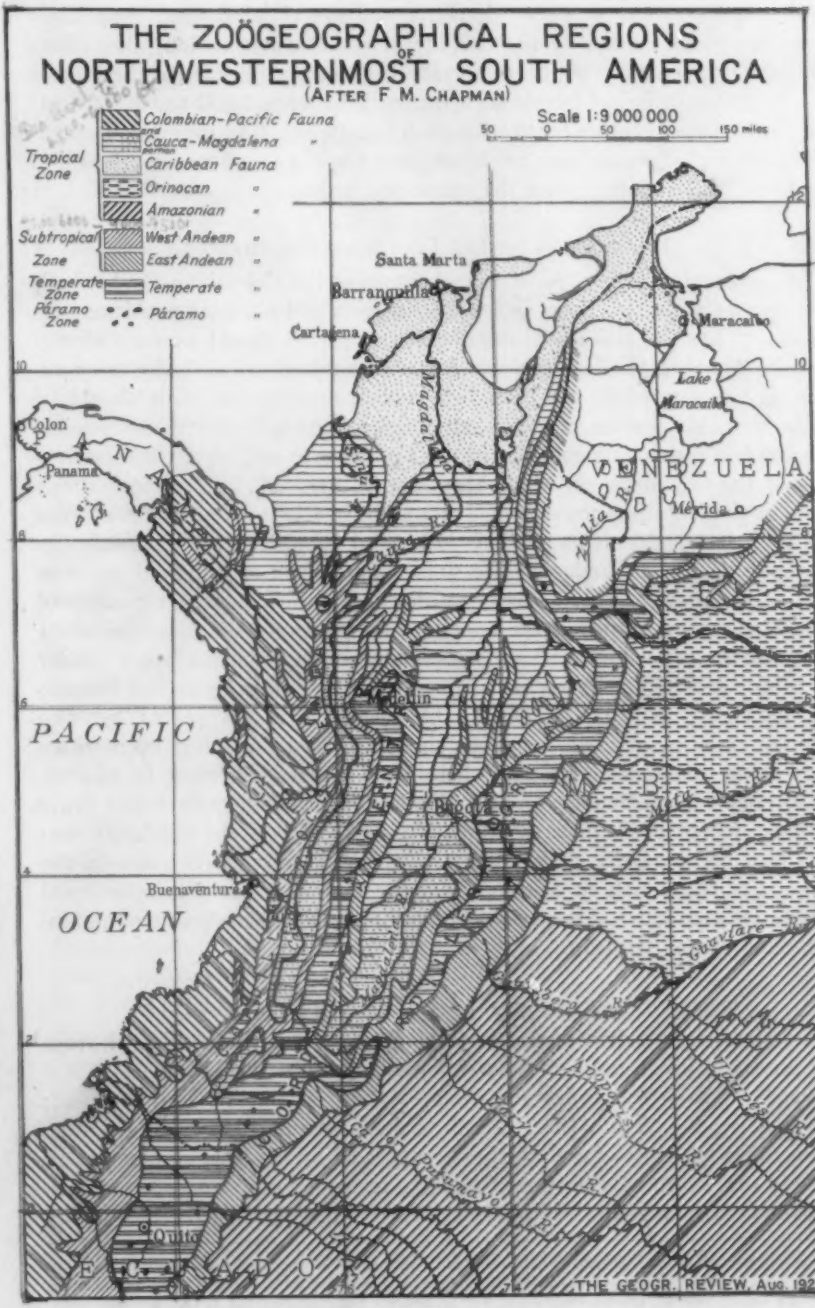
THE ZOÖGEOGRAPHICAL REGIONS OF NORTHWESTERNMOST SOUTH AMERICA
(AFTER F M. CHAPMAN)
Scale 1:9 000 000
50 0 50 100 150 miles
Tropical Zone
Colombian-Pacific Fauna
Cauca-Magdalena "
Caribbean Fauna
Orinocan "
Amazonian "
Subtropical Zone
West Andean "
East Andean "
Temperate Zone
Temperate "
Páramo Zone
Páramo "
Santa Marta
Barranquilla
Cartagena
Maracaibo
Lake Maracaibo
Colon
Panama
VENEZUELA
Mérida
Medellin
Bogotá
PACIFIC
OCEAN
Buenaventura
Quito
THE GEOGR. REVIEW, Aug. 1920

FIG. 2

subtropical and temperate in character and are cloud forests, their lower limit being determined by the altitude at which condensation takes place, while the upper limit of the temperate belt is coincident with the timber line.[2] The subtropical forests lie apparently between 5,000 and 9,500 feet. The lower forest is more continuous than the upper. The unforested mountains above the tropical zone are savana areas in the temperate zone, as also are those which extend above the temperate forests.

Distinctness of the Life Zone Boundaries

The discussion of the life, or faunal, zones of the Colombian Andes leads quickly to Chapman's main geographic interest and his main problem. He states: "That the altitudinal distribution of plants should conform closely to belts or zones, the limits of which are determined primarily by temperature, is not surprising; but that such mobile creatures as birds should be confined within certain more or less definite boundaries by these invisible barriers is a convincing evidence of their potency as well as of the sensitiveness of the organisms on which they act (p. 84) . . . . No one can stand at the foot of a snow-crowned mountain in the tropics without at once realizing that temperature, as it is influenced by altitude, is obviously the dominant factor in producing the floras and faunas encountered between base and summit. Where humidity, and in certain instances, character of the soil add their influence, the boundary lines between life zones are often very sharply defined. One may pass, for example, from the upper border of the arid tropics on the eastern slope of the Western Andes at San Antonio into the dense forests of the humid subtropics on their crest in less than two minutes and experience a complete change in bird life. But even where temperature alone is active, and there is no marked difference in rainfall, the forest being continuous, an altitudinal difference of 1,000 feet may bring one into an essentially new avifauna" (p. 84). "Even the condor, a sea-level bird of Patagonia, makes what we think of as his true home on the summits of the Northern Andes, where the factors which determine zonal boundaries keep him to his true level quite as effectively as they do a diminutive marsh wren" (p. 167).

Origin of the Present Distribution of Animal Life

The birds show a distribution in four vertical life zones, as follows: tropical zone, sea level to 4,500–6,000 feet; subtropical, from 4,500–6,000 feet to 9,000–9,500 feet; temperate, from 9,000–9,500 to 11,000–13,000 feet; *páramo* (treeless), from 11,000–13,000 to snow line at 15,000 feet (Fig. 2). These zones are very similar to those recognized by students of plants. In order to explain these conditions Chapman makes a very significant remark, as follows: "Any attempt to explain existing conditions must be preceded by

[2] Some geographers and biologists do not seem familiar with recent ideas as to the causes of the timber line on mountains, so that reference is here made to the studies on this subject by Cowles and by Shaw (see *Amer. Naturalist*, Vol. 43, 1909, pp. 420–431; *Plant World*, Vol. 12, 1909, pp. 1–15); *Ecology*, Vol. 1, 1920, p. 71.

an effort to picture to ourselves the effect on the fauna of a tropical region of the uplift in it of a mountain system to snow line (p. 87) . . . . Where such an uplift created a mountain system as continuous as the Andes now are, these new areas were doubtless populated by latitudinal extension of range from regions having similar climates, and by altitudinal extension as the pressure of life from immediately contiguous regions below forced species upward, the more adaptable of which survived" (p. 88). He then considers successively the influence of elevation, glaciation, and subsidence. The Andean uplift, geologists believe, took place in the Tertiary, with additional uplift in the Pleistocene. With this background it is significant to note how these conditions have influenced the birds. Chapman remarks that the subtropical birds have been derived "almost wholly" from the zone below; the temperate from the subtropical, in part, as well as elsewhere from the same zone at sea level, "while nearly all those of the *páramo* zone have come from the sea level equivalent of this zone in southern South America. It follows, then, that the birds of every zone above the tropics have been derived from a lower level. There are some exceptions to this rule, but they do not affect the general truth of the statement. In comparative variability the fauna of the subtropics differs more from the ancestral stock in the tropics than do the altitudinal forms of the temperate and *páramo* zones from their distant sea-level derivatives of the south temperate zone, with which indeed they are often specifically identical. Hence it follows that uniformity of life increases with altitude while, as a corollary, the number of species decreases; uniformity of environment being apparently the underlying cause" (p. 88). These are indeed very important conclusions which should interest every geographer and student of earth history. They are probably the most important discoveries of the whole study.

It would be well worth while to apply these same methods to other parts of the world and to formulate a world-wide view of these biogeographic relations. The preceding quotation also suggests that the importance of habitat relations is even greater than the present study elaborates and shows that the relation of habitats to life zones is a subject worthy of detailed investigation.[3] The kinds of birds decrease with altitude, in harmony with their simpler physical habitat. Chapman recognizes what he considers to be a Pacific coast pre-Andean tropical fauna (p. 89). On account of the former greater glacial activity on the Andes, he suggests that "existing zonal boundaries are post-glacial." As illustrating the influence of subsidence he cites the very interesting discontinuity of range of certain relatively sedentary subtropical birds occupying the mountains of Costa Rica and of

[3] See Chas. C. Adams: Baseleveling and Its Faunal Significance, with Illustrations from Southeastern United States, *Amer. Naturalist*, Vol. 35, 1901, pp. 839–852.

Idem: Migration as a Factor in Evolution: Its Ecological Dynamics, *ibid.*, Vol. 52, 1918, pp. 465–490; Vol. 53, 1919, pp. 55–78.

Idem: An Outline of the Relations of Animals to Their Inland Environments, *Bull. Illinois State Laboratory of Nat. Hist.*, Vol. 11, 1915, pp. 1–32.

A. G. Ruthven: An Interpretation of the Distribution of the Reptiles in Maggie Basin, Nevada, *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 948–952.

Colombia, these birds being absent in the intervening lowlands of Panama, where subsidence is inferred. In concluding his discussion of the factors which influence life zones no mention is made of the vegetation, although elsewhere he repeatedly points out its influence upon birds. In fact in several particulars the logical development of his general discussion is not well worked out, and he does not seem to have been interested in the recent valuable methods of geographical description developed by W. M. Davis.

The Pacific coast tropical zone is quite unusual in many respects. It possesses great diversity in habitats, is very humid, and has been the main center of origin for Colombian birds. Finally, it is more strongly characterized than any other equal area of tropical South America, having about 150 species and subspecies. This is a very remarkable condition for a continental land mass. The relation of this fauna to that of the Amazon is also a distinctive feature, an affinity also shown by the Pacific-slope freshwater fishes. There is evidence that one of the latest trans-Andean lines of faunal communication was in southern Ecuador. Another very significant geographical relation is shown in the Cauca valley, where but few kinds of birds are peculiar to the region. This fact suggested to Chapman that its fauna was a new one, and he suspected that the valley was the bed of an extinct lake. This idea is supported by White's geological evidence of a post-Tertiary lake in this valley caused by a volcanic dam.

In brief we may look upon the geographic origin of the bird fauna somewhat as follows: An elongated mountain range became elevated in the midst of a tropical region with a widely distributed Amazonian fauna and divided it. The Colombian Pacific tropical zone has now developed one of the most distinctive faunas found in the tropics on a continental land mass. As the mountains arose to a subtropical level a subtropical fauna was developed or evolved from the faunal stratum below. A part of this fauna was possibly destroyed by a depression in the Panama region, and a break in the continuity of range was made between the Colombian and the Costa Rican subtropical faunas, which at no point reached sea level. As the mountains continued to rise above the subtropical stratum and temperate conditions were developed, a direct continuity was established along the Andes (to the south) with the cooler lands near sea level, and a fauna migrated northward along the axis or backbone of the South American continent and mingled with that formed in place; later, as the alpine heights were reached, other invaders came from far south where they had been able to live at sea level. These alpine conditions were distinctly favorable during the period of alpine glaciers.

Conclusion

The many interesting and detailed distributional facts upon which these conclusions are based are discussed fully in pages 93–169, with tabulations and maps. The great bulk of the volume, as stated above, is devoted to the detailed notes on the numerous species of birds, and these notes are accompanied by several colored plates. A gazetteer of collecting stations

(pp. 640–656) contains information which is likely to be of value to many geographers as well as to bird students.

No one can read such an important and interesting volume without feeling the fascination of the problem and without hoping that the author may be permitted to extend his studies throughout the Andes. It may also be added that this is perhaps Dr. Chapman's most important contribution to zoölogy and to geography and will long remain a fine model for other students. Other naturalists and geographers will now become interested in testing his ideas. The bird population did not execute these migrations alone. The birds are dependent upon certain vegetational conditions and certain kinds of animal foods; and at the same time they would be followed by a predatory company, so that a whole biotic association must have traveled together and may be expected to furnish independent converging evidence on the origin of the South American fauna.

GEOGRAPHICAL RECORD

NORTH AMERICA

A Rune Stone in Minnesota as a Possible Indication of a Norse Expedition in 1362. The imprimatur of the Wisconsin Historical Society upon an article reprinted from the *Wisconsin Magazine of History* (Vol. 3, No. 2, December, 1919), entitled "The Kensington Rune Stone: Is It the Oldest Native Document of American History?" by H. R. Holand, justifies one in expecting a substantial contribution. And we are not disappointed in the argument and conclusions of the author of this extremely interesting analysis.

The subject of the paper is most unusual. There was found in 1898 at Kensington (a Minnesota village situated in the belt where the great coniferous forest of the North gives way to the open grassland of the Great Plains) a slab of stone 30 inches long, 17 inches wide, and 7 inches thick, and weighing about 230 pounds, the face and one side of which for three-fifths of its length are covered by an inscription in Runic characters. The stone was found under the stump of a tree whose roots embraced it securely. When the characters were deciphered the following inscription was made out:

> Eight Goths [i.e. natives of Gothland, Sweden] and twenty-two Norsemen on exploration-journey from Vinland through the western regions. We had camp by two skerries one day's journey north from this stone. We were [out] and fished one day. When we came home [we] found ten men, red with blood and dead. Ave Maria! Save [us] from evil!
>
> [We] have ten of our party by the sea to look after [or for] our vessels 14 days' journey from this island. Year 1362.

The inference from the inscription is that Norsemen conducted an expedition to the middle of the continent in 1362, and the argument of the author is devoted to a review of the previous discussions—some of which considered the stone as a forgery—and to an analysis of the historical and linguistic probabilities. The attitude of the author is conservative. He argues for the authenticity of the inscription on five principal grounds:

> (1) The position of the stone *in situ* and the practical impossibility of its having been placed in position by a man of eminent runic, linguistic, and historical accomplishments 100 miles from the nearest habitation in an unsettled wilderness.
>
> (2) The weathered appearance of the stone, showing that it had not been recently engraved.
>
> (3) The interpretation of the 14 days' journey in terms of the Norse idea of a "day's journey," which meant not a day on foot but the distance covered in a day's sail with a fair wind. Taking this to mean about 80 miles, the 14 days would be equivalent to 1120 miles, or approximately the distance from Hudson Bay to Kensington if allowance be made for a winding course.
>
> (4) The numerals, which long mystified students and which were not properly interpreted until 1909, when Helge Gjessing, a philologist of Christiania, showed that the numerals were "in perfect accord with runic numerals used in the Middle Ages."
>
> (5) The use of "Ave Maria! Save from evil!" which, written in part in Latin characters and with this peculiar wording, seems to show that it was written in the Middle Ages.

Mr. Holand concludes that these arguments, when considered together, leave little doubt that we have in the inscription an actual and important record dating from the fourteenth century. "It seems obvious that it would be impossible for a present-day forger to construct an inscription of such length and multiplicity of ideas without leaving indubitable proof of his forgery. Particularly would this be true of an inscription purporting to date from the fourteenth century, which is a peculiarly difficult period linguistically, runologically, and historically. The multitude of errors which critics have made in reviewing the inscription shows the difficulties any one of these men would have encountered if he had attempted to invent such an inscription. Yet this inscription, coming from an uninhabited wilderness, has survived all attacks made upon it for more than twenty years.

"In view of this and in view of the great significance of its message, it is surely time for our learned societies and institutions to cease their 'waiting and watching' attitude and take energetic action in thoroughly investigating the subject."

A New Snowfall Map of the United States. In 1913 Dr. Charles F. Brooks published an average annual snowfall map of the United States based on observations made at about 2,000 stations during the fifteen winters from 1895 to 1910 ("The Snowfall of the United States," *Quart. Journ. Royal Meteorol. Soc.*, Vol. 39, 1913, pp. 81–84, Pl. 2). This map has recently been reprinted in this country (R. DeC. Ward: The Snowfall of the United States, *Scientific Monthly*, Vol. 9, 1919, pp. 397–415). In the case of earlier maps the observations which were used came mostly from near sea level, and for that reason the heavy snowfalls on the mountains and at the higher elevations generally were not indicated. In Dr. Brooks's map use was made of observations obtained at the higher altitude as well as the lower. Topographic effects were also taken into account, and the map therefore showed, for the first time, the actual conditions of snowfall over the whole country with as close an approach to accuracy as was possible with the available data.

In the *Monthly Weather Review*, Vol. 47, 1919, Chart XVII, there is now published a new map of the average annual snowfall of the United States, originally prepared by J. B. Kincer of the Weather Bureau from all available records in the Western mountains and from the complete records east of the Rockies for the period 1895–1914. The map was then revised somewhat by Dr. Charles F. Brooks in order to bring it into conformity with certain obvious topographic influences, as well as with the previously published detailed map for the region east of the Mississippi, 1895–1913 (C. F. Brooks: The Snowfall of the Eastern United States, *Monthly Weather Rev.*, Vol. 43, 1915, pp. 2–11, Pl. 43), and of New England, 1895–1916 (C. F. Brooks: New England Snowfall, *ibid.*, Vol. 45, 1917, pp. 271–285, Fig. 30, on p. 285). The basic averages for the 20-year period of Kincer's original map have, however, been retained. The new map shows depths of snowfall for 0, 1, 5, 10 inches, and then for every 10 inches up to 60 inches.

The most striking points of difference between the Brooks map of 1913 and the modified Kincer map of 1919 concern the lines indicating the heaviest annual snowfalls. In Dr. Brooks's map lines showing depths of 100, 200, 300, and over 400 inches were drawn over portions of the Sierra Nevada and the Cascade Range, while lines showing amounts of over 100 inches were shown over fairly large areas of the Rocky Mountain system even as far south as northern New Mexico, reaching over 300 inches in southern Wyoming and 400 inches in parts of the Colorado Rockies.

On the map constructed by Kincer no amounts of over 60 inches are indicated by lines over any portion of the western United States, depths in excess of 60 inches being shown in figures. Thus, an observation of 527 inches is indicated over the central Sierra Nevada, this being the maximum snowfall shown anywhere on the map. Further, 459 inches are shown over the northern Cascades, in Washington; and 430 inches over the Cascades of Oregon. In the Rocky Mountain area a maximum depth of 337 inches is shown in the mountains on the Colorado-New Mexico border; of 298 inches in north-central Colorado, and of 250 inches close to the Idaho-northeastern Oregon line.

Over the eastern United States the two maps are naturally much more alike, because the annual depths of snowfall exceed 60 inches only over relatively small areas. The new map emphasizes somewhat more clearly the topographic effects of the northern portions of the Appalachian Mountains, especially in West Virginia and in New England. Both maps agree in showing annual snowfalls of over 100 inches in northern New England, at the eastern end of Lake Ontario, and along the Lake Superior shores of the northern peninsula of Michigan. The lines of equal depth of snowfall up to 400 inches, on Dr. Brooks's map, thus inevitably bring out very emphatically the heavy snowfall on the Western mountains, whereas the new Kincer map shows depths greater than 60 inches in the West only by printing the figures for scattered points. The latter method adheres more rigidly to the actual observations and allows less latitude to the individual judgment in interpolating the probable effects of topography. The former thus brings out more clearly the heavier snowfalls on the mountains; the latter is more strictly accurate.

R. DeC. Ward

AFRICA

Eolian Denudation in Relation to the Diamond Deposits of the Southwest African Protectorate. The prosperity of former German Southwest Africa was based upon the diamond discoveries of 1908. Diamonds formed the bulk of the exports of the colony—80 per cent in the year preceding the war—and constituted its chief source of revenue. The occurrence of the diamond here presents problems in economic geology whose interest has been generally heightened by the late change in administration. A brief discussion of the controlling physical conditions has recently been given by R. F. Rand in the paper "Angra Pequena (Lüderitzbucht) and Subaerial Denudation" (*Geol. Mag.*, January, 1920, pp. 32–35).

The Southwest African diamonds are found in a coastal strip extending from Conception Bay, 100 miles south of Swakopmund, to a point some 60 miles north of the

mouth of the Orange River, the richest fields being south and east of Lüderitzbucht (the Angra Pequeña of Bartolomeo Diaz). No diamonds have been found at a distance of more than 15 miles from the sea. Within this area the stones are found for the most part in the gravels flooring the broad, dry valleys. Their distribution is controlled by the prevailing south-southwest wind, which in the summer months blows almost daily with hurricane force. The wind appears to be purely coastal and to occupy only a shallow stratum of the atmosphere. Within its limited range, however, extraordinary effects of eolian denudation are accomplished in this desert terrain—effects well described by Harger in "The Denudation of the South African Continent" (*Trans. and Proc. Geol. Soc. of South Africa*, Vol. 16, 1913).

The topography of low ridges and rugged hills, the variable rock structure and composition afford ample scope for the carving of the fantastic forms that appear in the honeycombed and wind-bitten surfaces. The detrital material is accumulated in the broad-floored valleys and depressions in which the uppermost portion is lashed by the wind into "regular waves and miniature dunes." In the sifting process the diamonds and other heavy particles find their way to the surface and crests of the waves. Furthermore there is an enrichment on the windward side of obstacles and at the heads of valleys facing the direction of the wind.

Further responsibility attributed to the wind in the disposition of the diamonds is dependent on the origin credited to the diamonds. The primary source has been variously ascribed to the country rock; to a terrain in the interior either of the Protectorate or of the Union of South Africa whence the diamonds are carried down by the streams, in the latter by the Orange River and thence northward by the Benguela Current; to a submerged area off the coast. These several theories have been outlined by Wagner, who brings forward considerable evidence in favor of the last (P. A. Wagner: The Geology and Mineral Industry of South-west Africa, *Union of South Africa Geol. Survey Memoir No. 7*, Pretoria, 1916). Rand, however, "sees no reason why the enrichment should not have taken place from a landward area, and not necessarily from seawards" and thus that the south-southwest wind "may be entirely responsible for the denudation of the parent diamond-bearing rock as well as for the concentration of the diamonds after being set free." In this connection it may be remarked that the area in which the wind operates is approximately defined by the seaward limits of the aloe, *Aloe dichotoma*, an arborescent form which, common in the interior, is unable to stand the coastal wind.

AUSTRALASIA AND OCEANIA

The Adaptability of the White Man to the Tropics in Australia. The adaptability of the white man to the tropics is discussed more vigorously in Australia than almost anywhere else. The *Review* has commented (*Geogr. Rev.*, Vol. 4, 1917, pp. 401–403; Vol. 5, 1918, p. 86; Vol. 8, 1919, pp. 101–106) on the climographs of Taylor, which show how widely central and northern Australia depart from the climatic types best suited to the white man. A more favorable view is presented by Drs. A. Breinl and W. J. Young of the Australian Institute of Tropical Medicine at Townsville, Queensland (Tropical Australia and Its Settlement, *Annals of Tropical Medicine and Parasitology*, Vol. 13, No. 4, March 15, 1920, pp. 351–412). Their paper begins with a good section on the Australian climate in general and ends with an admirable section on life in northern Australia—the hot and stupidly built houses of galvanized iron, the great use of alcohol, the failure of many settlers to wear cool enough clothing and broad enough hats, the seasonal occupations, the migratory life, the high wages, and the hot season when "the least exertion causes profuse perspiration," and when, even at night, "although at rest with doors and windows wide open, one perspires freely and wakens up in the morning unrefreshed and more tired than one felt on going to bed."

Between these two geographical sections come two medical sections, one excellent, and one curiously inadequate and misleading. The excellent section discusses the changes in the physiology of the white race within the tropics and is worth summarizing.

(1) Body temperature. Same as elsewhere when at rest: essentially the same for all races. With exercise, however, the temperature rises more quickly than in cooler regions and falls more slowly. Much exercise has the same effect as a mild fever.

(2) Respiration. The rate is decidedly high, presumably to increase evaporation and thus reduce the body temperature. Abundant evidence indicates that evaporation from the lungs and skin has far more to do with the temperature of the body than has the amount of chemical activity.

(3) Blood pressure. No permanent change, but probably greater temporary variations after exercise.

(4) Blood conditions. Slight relative decrease in red corpuscles. The white corpuscles (leucocytes) not only increase in number but show more polymorphonuclear

neutrophile leucocytes among which a larger percentage have nuclei with only one or two instead of several fragments. The eosinophile leucocytes diminish. The exact significance of these conditions is not known, but our authors do not think them important. Except in disease there is no change in the specific gravity of the blood, and "the popular belief of the 'thinness of the blood' after prolonged residence in the tropics is, apart from anemia, due to disease, only a myth."

(5) Metabolism. Judging by the amount of food consumed, metabolism is as great in the tropics as elsewhere, but other evidence seems to show a zone of minimum metabolism near the optimum temperature, i.e. 60° to 70° F. As judged by the nitrogen in the urine there is a distinct tropical reduction in metabolism.

(6) Nervous system. Neurasthenia is undoubtedly common but may be partly due to other causes as well as climate.

(7) Clothing. A dark skin causes rapid heating and hence sweating and evaporation, thus cooling the body, but dark clothing has the opposite effect, for it merely holds the heat and prevents evaporation.

(8) Disease in general. Diseases are more common than elsewhere here because of (a) insects, (b) the weakening effect of heat, and (c) the unhygienic modes of life.

In the face of the evidence thus summarized the authors present a misleading section containing mortality tables. These appear to show that Queensland is the most healthy country in the world both for adults and for infants. In 1913 the general death rate is given as 10.4, against 10.8 for all of Australia, 12.3 for the Netherlands, 13.8 for England, and 14.1 for the registration area of the United States. These figures are worse than useless, for the population of Queensland, especially in the tropical parts, differs from that of an ordinary country in the following respects: (1) It is composed of settlers who are more energetic than the average of their countrymen. (2) It is largely migratory, and people who begin to feel the effect of the climate move away, so that their deaths are credited to some other region. (3) Most of the people are men from 20 to 40 years of age—ages at which the death rate is low. Women, who feel the tropical conditions more than men, are scarce. So, too, are old people, among whom, of course, the death rate is high, and young children, who feel a tropical climate most of all. (4) Indoor work in factories is very rare, but this is one of the great factors in raising the death rate in most of the countries that Breinl and Young use for comparison. (5) It is notorious that in a scattered, migratory population where physicians, clergymen, and officials are scarce and government is lax, a large number of deaths are not recorded even among highly civilized people.

The only proper way to determine the death rate in tropical Australia is to separate the population by age, sex, and occupation and then compare with a "standard" population. Even then allowance would have to be made for the migration of people who feel run down. Such a comparison would probably show a death rate at least double the 10.4 given by Breinl and Young. ELLSWORTH HUNTINGTON

Tropical Control of Australian Rainfall. The study of cirrus-cloud movements in relation to storm systems in Australia has led Mr. E. T. Quayle, who is supervising meteorologist of the Australian Commonwealth Bureau of Meteorology, to an investigation of the influence of tropical conditions upon the development and rainfall-production of storms in the temperate belt, and of the possibility of increasing the range and accuracy of the Australian rain forecasts ("Tropical Control of Australian Rainfall," *Commonwealth Bur. of Meteorol. Bull. No. 15*). The inland rains in Australia seem to be almost entirely dependent on drifts of air from lower latitudes, and it appears that the more directly these drifts take place in a southerly direction, the more abundant is the inland rainfall, assuming the rate of motion to be the same. The departures of the minimum temperature from normal were found to be the most available data for use in the endeavor to trace the origin of the inland rains. Graphical methods were employed for showing the relations between the temperature departures and the rainfall over several southern inland areas.

The results of this study have proved to be of the greatest value and have introduced a new, and most important, factor in rain forecasting. The conditions of the air in advance of and on the equatorial side of the path of disturbances which pass over the continent or along its southern coast line are the chief determining controls of the rainfalls which occur in connection with these disturbances. And, as the extent of this tropical influence can now be determined, by the method which is set forth in the present *Bulletin*, it has become possible to make the daily forecast more accurate as regards both the distribution and the amount of the rain which may be expected from each approaching storm. Thus, it appears that over the inland areas of South Australia and New South Wales, in winter, the rains are almost always preceded from one to two days by a marked rise of temperature over subtropical stations to the northwest. This rise is from 5° to 20° above normal and the greater the rise, the greater the rainfall. Further, the conditions in the subtropical belt are in their turn

dependent upon the rain-producing influences in the adjacent tropical belt, and, as these tropical conditions change slowly, it becomes possible to forecast, some days in advance, whether the rains accompanying the disturbances passing over the southern districts will be heavier or lighter than the average. Years of heavy southern rainfalls frequently show a nearly direct north-south drift of tropical influences, while dry years show an excess of "streams of influence" from other directions. The neighborhood of New Guinea seems to give the first indication of most of the inland rains of Australia, with the possible exception of those of Western Australia.

Mr. Quayle's monograph is illustrated by means of curves and maps. The results of his study open up a new and interesting field for further research. The relation here established between the rains over southern Australia and tropical conditions may, as the author points out, be as important in other parts of the world as in Australia, although it may be less obvious in latitudes higher than those of southern Australia.

R. DEC. WARD

POLAR REGIONS

The Plant Food of the Smith Sound Eskimos. The *Geografisk Tidskrift*, the journal of the Royal Danish Geographical Society, in 1918 (Vol. 24, No. 8) published an interesting article by Peter Freuchen on the part which plants play as food in the domestic economy of the Smith Sound Eskimos—a minor geographical item which has never before been dealt with exhaustively. Naturally, Freuchen finds that plant food is no significant part of the Eskimo diet. The vegetation is too sparse to produce any considerable quantity of food, and, besides, the Eskimos have no way of preserving for winter use the little that might be collected in the short summer.

The commonest of all plant food used is the mass of slightly digested vegetable pulp in the paunch of the musk-ox and caribou, and this—called *neruvkarsuit* by the Eskimos—is considered a great delicacy among them. Especially is it highly prized when it is accompanied by *akutak*. *Akutak* is a mixture of equal parts of water, narwhal oil that has melted out of the blubber in sunshine, and musk-ox or caribou tallow, stirred together cold until it forms a light mass resembling beaten white of egg.

The plants which are used directly for food are ten or fifteen in number. The first flower which appears in the spring in Greenland is the purple saxifrage (*Saxifraga oppositifolia*). As soon as the snow melts down, this dainty little flower begins blooming, and in the course of a few days after the snow has left a bit of ground the plot becomes purple with its blossoms. Then it is no uncommon sight to see the Eskimo women and children go out with their little seal-skin cups and collect the flowers. These they eat much as children here eat red clover. Occasionally they mix the flowers with seal blubber; then the mixture is considered very good indeed.

The Arctic willow is used as food in several ways. Its newly opened green leaves are laid upon boiled meat, much as we use cress; also it is used in *isegavik*, which is a mixture of half-rotted blubber, called *pujak*, with the willow down from the ripened willow catkins. The resulting mass is more like chewing gum than anything else, and the Eskimos use it as if it were. Caribou hunters who have to travel far overland like to keep chewing it all day long, because they say it keeps them from becoming hungry when they have nothing to eat.

One of the daintiest plants found in all North Greenland is *Silene acaulis*, a delicate little pink flower which grows in low round mats. Of this plant the Eskimos eat the root, which sometimes becomes as thick as a person's finger; more often it is only as thick as a lead pencil. When cooked carefully it tastes somewhat like carrots, and when made into soup, especially with whale blubber, it is very good.

The plant most used by the Eskimos is *Oxyria digyna*, a plant which tastes very much like sorrel. It grows almost everywhere in the North, and its red leaves and flower stems are visible for long distances. It tastes strongly of oxalic acid and because of its spicy sourness is particularly prized by the Eskimos as a dressing for meat. It is also eaten fresh just as it is gathered.

Two species of berries are found in the land, the "black" berry, or *Empetrum nigrum*, and the "blue" berry, or *Myrtillus uliginosa*, var. *microphylla*. In all, though, the berries are nowhere numerous, and Freuchen states that only once during all his stay in the North did the Eskimos gather more than they ate as they found them. A little farther south in Danish Greenland they are rather common and are preserved for winter use.

Apparently there are no poisonous mushrooms in Greenland, because the Eskimos do not hesitate to eat all species which they find. Likewise in times of stress they eat seaweed, both *Laminaria* and *Fucus*, boiling them down to a sort of jelly. The lichens, especially the big black *Gyrophora*, "tripe de roche," are also used in times of starvation, though the Eskimos state that continued use of these lichens causes disease.

Of late years the Smith Sound Eskimos have begun using *Pedicularis lanata* for a soup which tastes considerably like celery soup. The use of this plant has been introduced from Danish Greenland by the Eskimos who have come up from that region to live with the Smith Sound tribe.

But, Freuchen concludes, the fact remains that the Eskimos are satisfied only with a meat diet. Even after they have eaten at a white man's table a meal of cooked meat, vegetables, and fruit that would do justice to the heartiest white man's appetite, they resort at once after the meal to some raw walrus or seal meat, because, as they say, they are still hungry for some *real* food. W. ELMER EKBLAW

HUMAN GEOGRAPHY

Weather and Business. The Committee on Statistics of the Chamber of Commerce of the United States recently issued (1919) two bulletins, on business and weather in relation to rainfall and in relation to temperature. A paper on the general question of making practical use of such facts as are available was presented before the meeting of the American Meteorological Society at St. Louis, December 30, 1919, by Mr. A. W. Douglas of the Simmons Hardware Co. of St. Louis (*Monthly Weather Rev.*, Vol. 47, Dec., 1919, p. 867).

The two bulletins are based on the conclusion that spells of extreme heat and cold, of abundant rainfall and of deficient rainfall, tend to recur. Also, the same kinds of seasons have a tendency to recur, in the way of the association of dry years with dry years, and of wet years with wet years, for a comparatively brief period. Exceptions to this tendency occur, but in an experience of a number of years this general statement has proved to be fairly reliable for business purposes in from 75 to 80 per cent of the time.

A possible forecast of the general character of the weather, some months ahead, would obviously be of great advantage in relation to the probable sale of "seasonable goods," i.e. of "goods which sell only at certain seasons, and then because of the prevalence of certain kinds of weather." The author indicates that some degree of success has been attained by the application of the general principle of the probability of recurrence of certain types of seasons to the business in which he is interested. To quote: "Suppose a distributing house handling both lawn mowers and rubber hose wish to find out in August, 1918, about how they should order these goods for the coming season of 1919 compared with their sales in the season of 1918 just past. The theory I have spoken of forecast very definitely a wetter spring and summer in 1919 than in 1918 in the vicinity of St. Louis, and that is exactly what happened. Now, suppose this same house wished to know in February, 1919, what kind of an autumn and winter 1919–1920 would prove, as to temperature and snowfall, as compared with the similar season of 1918–1919, as affecting the sales of ice skates and snow shovels. The theory answers, a somewhat colder autumn and winter and rather more snow. Now, these incidents are the stories of actual happenings." R. DEC. WARD

GEOGRAPHICAL REVIEWS

The Development of Japan

K. S. Latourette. **The Development of Japan.** xi and 237 pp.; map, bibliogr., index. The Macmillan Co., New York, 1918. $1.50. 8 x 5½ inches.

This work is composed upon lines similar to those adopted in the author's "Development of China," to which indeed it well serves as a companion volume.

The author rightly makes the introduction of Buddhism into Japan the commencement of a new era, for with Buddhism, introduced from China by way of Korea, came Indian philosophy, Indo-Grecian art, and Chinese social and political theories.

Before taking up the discussion of the transformation of Japan by modern intercourse with Western nations, Professor Latourette pauses to describe somewhat at length the civilization of old Japan, in a very interesting and illuminating chapter. He says truly: "The Japan of 1917 is so decidedly the child of the Japan of 1850 that to know the first one must be acquainted with the second" (p. 80). A prominent feature of that civilization was the dominant position of the military class. "This class," he tells us "controlled the state" in the eighteenth century. Its presence "was in many respects to be a distinct advantage to Japan in the new age brought by contact with the West". . . . . "The government is still largely dominated by their descendants" (pp. 81, 82).

If we bear this in mind we shall better understand many th ngs that have occurred in recent years in the Far East and better appreciate the present situation there.

Professor Latourette rightly calls attention to the debt which Japan owes to China. From China her early civilization was wholly derived. The influence of China he finds particularly evident in the family life and its solidarity. Feudalism grew up partly as a result of the failure of the attempt to adapt the administrative system of the Tang dynasty to Japanese conditions. Japan, of course, was not sufficiently advanced at that time to take over the political organization existing in China. Bushido he regards as unmistakably indigenous, although showing effects of Confucianism and Buddhism. The feudal lords no doubt had their retainers from of old, but Bushido, or "way of the soldier scholar," is undoubtedly modeled upon the chivalry of the Chinese feudal ages. It was China who divided her people into four classes; scholars, farmers, mechanics, and merchants. The shih, or "scholar," was placed first. Japan adopted this division, but as she placed her military class at the top of the social scale, she modified the word shih by the adjective bu, that is "military," making the foremost class that of the military scholar and the code of the military scholar the bushido. Many of the deeds of Japan's chivalrous knights can be paralleled in Chinese ancient history.

Bushido required the samurai to "sacrifice life, truth, and even his family if the service of his lord required it." This will explain some curious occurrences in recent years. The loyalty of the knight in the olden days was not to the Mikado but to his own daimio. Today we find sometimes as a result of this teaching of the loyalty of Bushido that men have attempted to justify themselves in the commission of crime by claiming that in so doing they were but showing their loyalty to their superiors. In 1917 a director of the Dai Nippon Sugar Company was found guilty of preparing false balance sheets and of bribing members of parliament. His defense was that the illegal acts were in accord with Bushido, that these measures were necessary to the success of the company. His loyalty, in other words, was to the company, not to the public. Professor Latourette states that Bushido encouraged the showing of magnanimity to a defeated enemy. But magnanimity to a defeated enemy does not appear to have been a marked characteristic of the Japanese knight. Captain Brinkley says: "By the standard of modern morality the Japanese samurai would be counted cruel. Holding that death was the natural sequel of defeat and the only certain way of avoiding disgrace, he did not seek quarter for himself or think of extending it to an enemy. Yet in his treatment of the latter he loved to display courtesy until the supreme moment when all considerations of mercy were laid aside." The wide gulf which divided the samurai from the commercial and agricultural classes made the military class indifferent to the sufferings of these lower orders and ofttimes brutal in their treatment of them. These things should be borne in mind by those who are disposed to think too highly of the system. If truth and honesty can be sacrificed through a mistaken sense of loyalty to one's superior and if mercy is wanting in the treatment of the less fortunate, it is not difficult to understand how men trained in such a school can be courageous and patriotic and yet be guilty of cruelty to men of

another race, as is charged of the conduct of the Japanese in Manchuria and Shantung, and show such deception as was practiced towards the Western nations in regard to the Twenty-one Demands.

Issue must be taken with the statement (p. 151): "Like the Riu-Kiu Islands, Korea had in years past recognized the simultaneous suzerainty of both Japan and China. Tribute-bearing embassies were sent both to Peking and Yedo."

There does not appear to be any reliable evidence that Korea was ever tributary to Japan or ever acknowledged in any way her suzerainty until compelled to do so against the will of her ruler and people in 1895. It will always be a stain upon the good name of Japan that her accredited minister to Korea, Viscount Miura, was found guilty by a Japanese court of participation in the plot which led to the murder of the queen of Korea in October, 1895. For, although Viscount Miura was recalled, he was subsequently made a Privy Councilor and still holds that post.

That the war upon China over Korea was "a clever ruse of the government to withdraw the attention of the nation from the constitutional struggle" then going on in Japan seems a fair deduction from the condition of affairs at the time. The author, however, mentions this as the opinion of others, not his own.

The apology for the annexation of Korea (p. 183) seems to the reviewer unconvincing. If the self-determination of peoples is a right worth affirming, then the people of Korea would seem to have a right to such government as they desired, even though it might not have been so efficient as that which has been given them by Japan. That the Japanese government of Korea has, indeed, been very efficient cannot be denied, but one doubts whether that affords sufficient excuse for the violation of the repeated pledges given by Japan to respect her territorial integrity and independence. If there be anywhere in this world treaties that have been made "scraps of paper" those relating to Korea would appear to deserve a place at the head of the list.

The rapid increase of Japan's population explains the desire of the natives of that country to find a home in the fertile and sparsely settled valleys of Manchuria. But immigration ought not to bring in its train the interference of an alien government with the sovereign rights of a neighbor. Professor Latourette points out the discrimination shown by the Japanese in their management of the South Manchuria Railway against the trade of the citizens of other nations. The author, however, palliates Japan's violation of her word to preserve the open door, saying (p. 186): "Considering all the temptations that Manchuria presented and the cost at which a foothold in it had been acquired, it would have been strange, although highly commendable, had Japan stayed strictly by her plighted word."

Japan's relations with China during the World War are touched upon, but the book went to press before the latest phase of the Shantung problem developed.

Of the Lansing-Ishii agreement he writes (p. 208): "It was greeted with no great enthusiasm by the press in either America or Japan, for to many of the public in both countries it seemed that each foreign office had conceded too much. The Chinese were bitter in their denunciation; the agreement seemed to them to be the desertion of their last remaining protector against the aggressions of Japan, and Peking registered a formal refusal to be bound by any conventions to which she was not a willing party."

On the whole the work is an excellent summary of Japanese history and is well adapted to serve as a university textbook. E. T. WILLIAMS

THE POLISH POPULATION OF PRUSSIA BEFORE THE WAR

EUGENIUSZ ROMER. **Polscy na kresach pomorskich i pojeziernych** [and French résumé under title:] **La population polonaise dans les pays limitrophes baltiques, maritimes et lacustres.** 255 pp.; maps, diagrs. (Series: Prace Geograficzne Wydawane Przez Eugeniusza Romera, Zeszyt II.) **Lemberg**, 1919. 11½ x 8½ inches.

Recent Prussian censuses for the four provinces Bromberg, Marienwerder, Danzig, and Allenstein are criticized in this work with regard to their representation of the Polish population. High credit is given the Prussian census bureau for scientific spirit, efficiency, and economy. They finish their total work in less than three years, at a cost of 2 pfennigs a head, *including printing!* But many inconsistencies are pointed out that seem due to the fact that the execution of the work in detail is in the hands of a great number of functionaries who are strongly biased against the publication of objective truth. Some specific complaints are that Germans are forbidden to give Low German as a mother tongue, while the Polish dialects, Kashubian and Masurian, must be reported as such and not as Polish; thus diminishing by 300,000 the number of Poles reported by the census. A further striking result is to make the isolated fragments of Slavic population in northern Allenstein, whose patriotism is sharpened by life among surrounding masses of Germans, insist on being reported as Polish, while the solid masses of Poles farther south from whom they came are declared to be Masurians! Moreover, since objective reality has not been reported, successive censuses report

most freakish changes. For instance the Kreis Kartuzy, just west of Danzig, gave its percentages of Kasubbian *and* Polish-speaking people at the four census dates 1890, 1900, 1905, and 1910 as 66.4, 69, 69.4, 72.1 per cent of the total population—very reasonable changes; but on dividing the number of Kashubians by the sum of Kashubians and Poles we find the percentage of Kashubians to be 43, 99, 47, and 99, incredible fluctuations. The people were not reporting their mother tongue, but a report of it was being put in their mouths by officials who did not contrive to be consistent.

Another inconsistency pointed out is the greater excess of women among the Poles than among the Germans. The suggestion is made that the Polish young men are sent to other parts of Prussia for their military service and German recruits sent to these provinces in their places. This is justified by census figures for the same districts by age periods. For 100 Polish men of 10–20 years there were 102 women, but for 100 men, age 20–30, there were 133 Polish women; for Germans the proportions of women for the two age periods are 100 and 95.

Many other discrepancies are noted.

The reviewer does not find all Dr. Romer's arguments clear, a condition to which very careless proof reading contributes. There is some haze around the school coefficient. Polish school children are reported by a separate census as numerous beyond expectation. It seems as if they were more consistently and objectively reported. A formula is based upon their number to estimate the true proportion of Poles in every district. Also use is made of numbers of voters for Polish candidates for the Reichstag to control the census figures.

The Prussian census estimates for the six eastern provinces of Prussia and five neighboring *Kreise* was 3,000,000 Poles. Romer would add of Kashubians, Masurians, and bilinguals nearly 500,000; for correction of official figures, over 500,000; and of Polish emigrants to other parts of Prussia, 900,000. So that he finds 4,000,000 to 5,000,000 Poles in Prussia in 1910.

He produces a map of the distribution of these Poles, which shows them occupying the ground much more continuously than on the maps of the Prussian census. This, too, he reproduces on the same scale and in the same style; also a map by Langhans of the same date and from the same data. He has had the areas of Polish predominance measured on all these maps, finding 11,000 square kilometers on the Langhans map, 17,000 on the map from the Prussian statistical atlas, and 20,000 on his own.

There can be no doubt the Germans underestimated the Polish inhabitants of these provinces. It is to be hoped we may have the detailed results of the plebiscite in Allenstein to compare with these figures.

MARK JEFFERSON

A GEOGRAPHICAL COMPENDIUM ON NORTH AND SOUTH AMERICA

ONÉSIME RECLUS, edit. **Grande Géographié Bong Illustrée: Les Pays et les Peuples:** Vol. 5 **[North and South America; Polar Regions].** 371 pp.; maps, ills. H. DE LAMOTHE: **Canada,** pp. 3–40; J. G. KERGOMARD: **États-Unis,** pp. 43–136; L. MARC-SCHRADER AND J. G. KERGOMARD: **Les Antilles,** pp. 137–146; DÉSIRÉ CHARNAY: **Mexique et Amérique Centrale,** pp. 149–202; VICTOR HUOT: **Amérique du Sud (Brésil, Paraguay, Uruguay, République Argentine, Chili, Bolivie, Pérou, Ecuador, Colombie, Venezuela, Guyanes),** pp. 205–318; GUSTAVE REGELSPERGER: **Les Régions Polaires,** pp. 321–360; ANTOINE CABATON: **Les Modifications Territoriales de la Péninsule des Balkans,** pp. 361–364. Bong & Cie., Paris, 1914. 15 x 12 inches.

Volume 5 of this series of geographies (of which Vols. 1 and 2, Europe, were reviewed in the *Geogr. Rev.*, Vol. 6, 1918, p. 378; Vol. 3, Scandinavia and Asia, in the *Geogr. Rev.*, Vol. 7, 1919, pp. 194–195; and Vol. 4, Africa, in the *Geogr. Rev.*, Vol. 4, 1917, pp. 327–328) covers all the lands of the western hemisphere. Neither pains nor expense have been spared to make the book attractive; it is handsomely bound, printed on a fine grade of paper, copiously illustrated with many pages in color, well supplied with maps, and, most essential of all, it is a carefully considered and well-balanced account of the lands, peoples, and industries of the various countries of the Americas. The size of the book, printed in folio, and the excessive weight are, however, prejudicial to its use in a private library and will in all probability limit its use.

The maps deserve special commendation. There are double page maps, physical and political, of the larger divisions of the western world—a better physical map of the United States, 1:10,000,000, than can be found in most United States publications, and the collection of these, of which there are fourteen, would make an excellent general atlas for North and South America. In addition to these, the text has smaller maps, seventy-one in all, of climate, of density of population, and of special locations, such as the environs of New York City, which render the text particularly illuminating.

The 364 pages of text in the volume are divided among the divisions of the western hemisphere in the following proportions: Canada, 11 per cent; United States, 25;

Antilles, 2.5; Mexico and Central America, 16; South America, 32; Polar Regions, 13; and the Balkans—which discussion apparently is a supplement to an earlier volume with the materials brought up to the date of the settlement of the boundaries following the last Balkan War—0.5 per cent. The treatment of the countries with the exception of the United States is to a large degree similar and follows the usual order and topics found in most general geographies. In the case of the United States, the people particularly are made the object of an analysis, which shows a mixture of careful evaluation of the national character and a too great trust in national caricatures. While now and then the author describes certain specific or provincial traits as being more widely prevalent than they actually are, on the whole he has probably made as fair an estimate of the people of the United States as any one so situated could.

To see ourselves from the viewpoint of an outsider is at all times a desirable thing, although sometimes it is not altogether a pleasing experience; yet the reading of this description of the American character is not in the least unpleasant; on the contrary, possibly because of that self-assurance which the author insists is one of our leading traits, it is often amusing.

The account opens under the heading of "a country without a name," and it is stated that the "United States of America" is not a sufficiently explicit designation for the Union, and furthermore is an awkward name in that it does not allow the use of a single word for the inhabitants as is common in Europe when one speaks of the French, English, etc. Again, in the same connection, it is hinted that the insistence upon the word "American" shows a desire to absorb all of the two continents and to extend the "America for the Americans" slogan much more than to a belief in the Monroe Doctrine of exclusion of eastern hemisphere control; to extend it even to an actual absorption of the western world by the United States. This same feeling is expressed again in the analysis of the race by the insistence that American imperialism has not said its last word. While Africa seems closed to it, the breaking up of China and the troubles in Latin America, it is predicted, will give occasion for its manifestation again as formerly at Panama.

The author considers the unity of races in the United States through absorption as a wonderful phenomenon. He quotes the motto "E pluribus unum" as more than a motto, as the statement of a reality which has come to pass through the experience of years. That many races, of many creeds, from all kinds of lands should settle in a strange land and become absorbed by another race altogether foreign to it is to the European a strange and remarkable realization of the ideas which the political union of a few somewhat allied colonies in the infancy of the Republic somewhat ideally expressed in this motto.

Our "mushroom" cities—and all save Boston, to which the author pays homage like a Bostonian, and New Orleans are rated in this class—are too new to attract the European, whose idea of a city includes a historical background with relics, sepulchers, and sacred shrines. The absence of a history is given as a reason for the common designation of the streets by numerals and letters, as "corner of 7th Avenue and 253rd Street," on the ground possibly that since the country is so new we have long ago used up all the historical and descriptive names and thus must resort to numbers as designatory titles. The idea that such a system is one of great convenience to the stranger has apparently never been introduced to the author or, if so, has never been accepted as worthy. "If you know one American city, you know them all." The streets cross at right angles, there are "blocks" of equal dimensions, and in the business districts there are invariably "sky scrapers" because the land is so valuable—these are the main items in the description.

The American is described as above everything else devoted to business. Trading has assumed in Yankeeland an importance beyond its due, the author asserts; it occupies the whole life, the child at school does not dream of the stripes of the officer or of a great administrative station, his dream is to be a great business man. Save the small minority who continue their studies, children are thrust into active life at an age when the little European thinks only of play. It is amazing that an estimate of the American tendencies is given so confidently by a scholar who has so much to say about the historical background, without some slight glimpse into the idealism and ethical doctrines which are instilled into the American youth at school through the medium of literature. If this had been done, and the models which are set for the youth to emulate—from Robert Bruce up—had been appreciated, the author would not have emphasized the fact that the man who fails is not dishonored and lost, as in France, but is allowed to begin again. The greater part of this estimate is one of superficial comparison without any attempt to dig down to the roots.

In concluding, the American is described as muscular and lean, boastful of his strength and endurance, enjoying out-of-door sports, and somewhat less well-knit than the Englishman. "The women are pretty, at times remarkably handsome, especially in high society. Those living in Baltimore are universally famed, tall and

slender, gracious, decidedly alluring, owing to sports and to the independent life led since infancy. The eyes and the hair are superb, the color recalling that of the English; but, unfortunately, the teeth are often large and very frequently filled with gold." The American diseases are enumerated as tuberculosis; stomach trouble, induced by the use of ice water, spiced foods, sometimes by alcoholic liquors, the habit of midday meals, swift living, and constant attention to work; nervousness due to a noisy and exciting work; and appendicitis.

These are given as types of estimates of the American. It is not desirable to judge the entire work by these, for in the descriptive parts of the text, and it is mostly that, the writers are not influenced so much by their own ideals of life and appear more at home in interpreting topography and climate than they do in dissertating on character.

ROBERT M. BROWN

TRAVELS IN ALASKA

HUDSON STUCK. **Voyages on the Yukon and Its Tributaries: A Narrative of Summer Travel in the Interior of Alaska.** xvi and 397 pp.; maps, ills., index. Charles Scribner's Sons, New York, 1917. $4.50. 9 x 6 inches.

Dr. Stuck is a Protestant Episcopal clergyman who has lived many years in Alaska. All he has written about that country is worth while because he is a keen observer who has traveled thousands of miles there, has studied the things he describes, and strives for accuracy in all he writes. He expresses regret that he lacks scientific geographical training; but he has qualities that make his books valuable to all readers who seek reliable accounts of Alaska. He is a keen observer, mixes common sense with all he writes, seeks nothing but the truth, and records what he sees in a way to hold attention and interest.

Dr. Stuck traveled in his steam launch *Pelican* along the Yukon River and its tributaries for ten summers, covering in that time about 30,000 miles and noting all the way the things that seemed to him most important, such as the regimen of the waterways, the forests, plains, flora, fauna, climatic conditions, mines and miners, settlements, natives, and so on. We may consider this book as a fairly complete summary of Alaska, in most of its aspects.

Only a few bits of the information the book contains can be mentioned here. Dawson, the capital of the Yukon Territory, is in process of steady decay because the placer diggings are exhausted and no quartz veins have yet been discovered to prolong its life. The town had extensive development; it contained many substantial buildings and attractive residences and gardens, but it will meet the fate that befalls most placer-mining towns after their alluvial gold is exhausted. Forty Mile, Circle City, and other famous placer regions are also nearly exhausted.

Above its White River affluent the Yukon is a clear, pellucid stream; White River heads in glacial brooks, and its turbid waters so becloud the Yukon as completely to destroy its limpidity. At the mouth of the Tanana tributary, darkened with the wastage that the glaciers at its source have dug from the soil, the Yukon turns nearly black. What Dr. Stuck saw, in the course of years, of the tremendous power of ice to grind down mountains and carve out valleys, convinced him that glaciers have been far more potent than earthquakes and volcanoes and most other agencies in changing the surface of the earth.

It is only of late years that the name Yukon River has been applied to all its variously named stretches. It was discovered piecemeal, and explorers gave special names to the parts they reached, not knowing that they constituted a continuous stream.

Years ago, our newspapers had much to say of the agricultural possibilities of Alaska. Dr. Stuck does not share these sanguine views. It has been proved, he admits, that hardy and early varieties of grain and garden vegetables may be ripened. But truck farming is profitable only in the neighborhood of the mines. When mining shall give out remote Alaska can never hope to raise crops for export in competition with other countries.

CYRUS C. ADAMS

LATIN AMERICAN HISTORY

W. W. SWEET. **A History of Latin America.** 283 pp.; maps, diagrs., ills., bibliogr., index. The Abingdon Press, New York and Cincinnati. 1919. $3.00. 8½ x 6 inches.

Teachers of Latin American history have often sought, unsuccessfully, for just such a book as this. There has been no comprehensive work in English, we believe, that would serve as a textbook for the courses now being given in many of our colleges and universities. This is true particularly regarding the colonial period. Over a half of the present volume is given to that field. In its wealth of detail it will also be of value as a reference work to the student and to the general reader. For the latter

purpose the volume would be of far greater service if the reading lists contained reference to other than English works.

As to the maps—there are twenty of them in all—some are well suited to the end desired, though only sketch maps. Others, such as that showing the mineral production in South America (opp. p. 244) are worse than useless. Tin is shown as a product of northeastern Bolivia, the low rubber country of the Amazon. No petroleum is ascribed either to Peru or Argentina, nor is coal given among the minerals of Chile. The railway map opposite page 244 would lead one to suppose that there was no possibility of going by rail from Buenos Aires to either Asunción or Rio de Janeiro, while the line shown as skirting the western shore of Lake Titicaca exists only as one of the numerous *proyectos* that cover the continent.

Errors in statements, too, occur. Tacna and Arica were not lost by Bolivia but by Peru (see p. 187). The sovereignty of the vast Loreto region on the headwaters of the Amazon still remains undecided (see p. 185).

In spite of such faults this work should be of real and permanent value to students of Latin America.

A Topographical Survey of the Aconcagua Region of the Andes

Robert Helbling. **Beiträge zur topographischen Erschliessung der Cordilleras de los Andes zwischen Aconcagua und Tupungato.** 77 pp.; maps, ills. *Jahresbericht Akad. Alpenclub Zürich*, Vol. 23, 1918.

Dr. Robert Helbling of Flums, Switzerland, the author of this exceptionally valuable cartographic study, intended to prepare a large volume on the mountain journeys that he made in the Argentine-Chilean Andes, chiefly in company with Dr. F. Reichert, between 1906 and 1912, concerning which Reichert has already published several articles; but, the war intervening, the present fraction of the total is published with the expectation of bringing out the remainder later. Both text and maps are manifestly the work of a well-trained and experienced topographer and mountaineer, such as Switzerland may well take pride in producing.

The first section of the essay (pp. 5–8) gives a geographical summary of a 70-mile stretch of the Andes between Aconcagua, 7,010 meters, in latitude 32½° S. and Tupungato, 6,650 meters, in latitude 33½° S. Near the former mountain is the Uspallata Pass, 3,799 meters, crossed by Charles Darwin and by Jeffries Wyman, 85 and 60 years ago respectively, and now tunneled by the Transandine Railway. The second section (pp. 9–22) treats the previous mapping of the district and corrects certain statements to the effect that only small cirque-glaciers exist in this part of the range by the announcement that large and long valley-glaciers of true Alpine type occur. A third section (pp. 23–27) describes the author's topographic surveys, made by the "stereophotogrammetric" method, at the cost of the Transandine Railway and of the South American Hotels Company, supplemented by personal funds. The resulting maps, as far as published, are described below. Notes on the geology, physiography, and glaciation occupy a fourth section (pp. 28–46): Tupungato is here described as a lofty volcano, its summit seeming to be a broken or dissected crater rim, while several lava flows descend its flanks. Aconcagua, although long reputed to be a volcano, is surely not so, as several earlier explorers have pointed out; it is the eroded remainder of an overthrust mass, chiefly composed of hornblende porphyry. About midway between these two lofty summits is a group of mountains dominated by the Juncal, 6,110 meters, also not a volcano, although consisting largely of volcanic rocks which have been uplifted and dissected into their present form. Here are the largest glaciers of the area under consideration; the longest of them, the Ventisquero del Plomo, is the trunk of a complex glacial system; it is illustrated by several half-tone views in the text and measures 17 kilometers from its snow crests at 5,000 meters to its end at 3,165 meters.

In general the mountainous highlands show maturely dissected or subdued forms ("Die Formen . . . . entsprechen einem reif zerschnittenen, z. T. sogar unterjochten Bergland"), in which, after upheaval had introduced a new cycle of erosion, deep and mature trough valleys have been eroded, heading in glacial cirques; but the rounded forms of the lofty highlands, true "Mittelgebirgsformen" in spite of their height and of interruptions here and there by unsubdued cliffs, still prevail between the deep valleys; and the cirques, large as they are, appear only as niches excavated in the mature domes of the earlier cycle. Lateral valleys are said to hang above the main valleys, but the author does not take sides for or against glacial erosion as a cause of their hanging, although he mentions the former greater expansion of the glaciers as indicated by the occurrence of glacial striae at an altitude of about 3,000 meters, 20 kilometers down valley from the present end of the Plomo glacier. The dry climate supports few streams, and the heavy mountain masses are therefore little subdivided between the main valleys. Rapid weathering of relatively weak rocks has cloaked the mountain sides with long slopes of detritus. The main valleys show neither rock steps

causing rapids or falls, nor rock basins holding lakes, but are heavily aggraded with rock waste swept down by their braided streams and therefore present an equalized descent. Vegetation is scanty and animal life is rare; except near the railway, no signs of human occupation are to be seen. Thus the Andes here contrast strongly with the Alps. They lack the enlivening alternation of bold peaks, bare cliffs, and brilliant snow fields, of forest, pasture, and field; the surface is largely stony and sterile, without splashing streams and whitened cascades. No human settlement or trace of human activity is visible, although wretched, forsaken herds are occasionally met. The unconcealed natural colors of the bare rocks unite in manifold and quite improbable combinations, which with the simple outlines of huge mountains, their untouched isolation, and complete silence, constitute views of magnificent and restful beauty.

A sixth section (pp. 46–77) is devoted to Alpinism, for which the region is highly recommended. A list of all important ascents since 1882 is here compiled. It may be noted that a good hotel is now established at the Puente del Inca, 2,850 meters, 25 kilometers east of the Uspallata tunnel, where camping equipment, mules, and guides can be hired. An 18-page supplement on the height of Aconcagua is bound in with the reprint of the main article. This great mountain is given an altitude of 7,010 $\pm$ 32 meters and thus ranks as the highest of all American summits.

The five maps that accompany the essay are the product of the map-engraving establishment "Kartographia Winterthur." One is a general map compiled from various sources on a scale of 1:250,000, extending somewhat north and south of the stretch of the range that Helbling especially studied. The four other maps are large sheets reproduced on a scale of 1:25,000 from originals of the same scale by the author; three of them represent a district measuring about 30 by 15 kilometers around the Juncal with its many large glaciers, presumably the center of touristic interest; while the fifth map represents the southwestern side of Tupungato, with its glaciers, and shows the author's path of ascent to the summit. These maps are of exceptional interest, being much more detailed than any previously published. The mountains are tinted in brown, with sketched brown contour lines of 25 meters interval on the smoother slopes, and brown hachures for the more abrupt forms. Snow and ice are contoured in blue, with a light-blue tint on their steeper parts, and with appropriate indication of crevasses and moraines. As the mountains and glaciers are rarely named, Helbling added several new names to the few that he found in local use to aid his descriptions; all are given in Spanish. Maps and text alike should prove indispensable to future explorers of the seldom visited Juncal group.

W. M. Davis